Serial Number: 09/232,566
Appn Filed: 01/15/99
Appellant: Rolf Jansen
Appn Title: Tractor/Trailer Back-up Kit
Examiner/GAU: Tung Vo, 2613

APPELLANT'S BRIEF

Appellant, Rolf Jansen, pro se, very respectfully appeals to the Board of Appeals and Interferences from the Final Office Action, rejecting appellant's claims, and will show the Board the following:

I
Summary of Invention

The two claims of the appellant concisely summarize the invention:

An assembly of a camcorder-type liquid crystal display monitor, comprising means for mounting said assembly to the inner retracted side of a driver's sunvisor of a motor vehicle,
whereby said sunvisor, when lowered, allows a driver easy, direct, close-range, sunlight-protected viewing of said monitor screen, as if the screen were a rear-view mirror, when used in conjunction with a video camera, to see to the rear when the unaided view is obstructed.

An assembly of a micro-video, pin-holed lens camera, comprising means for mounting said assembly on the reverse side of a plate, such as a license plate, at the rear of a trailer or motor vehicle, so that said camera can see through a predetermined-sized hole put in said plate,
whereby said plate-mounted assembly conceals said pin-holed lens camera to lessen the risk of vandalism,
whereby said camera is located in the ideal position at the

rear of a trailer or motor vehicle for viewing a backing, when used in conjunction with a monitor.

II
Issues

Appellant contests the examiner's conclusions for rejection of appellant's two claims. Said conclusions are stated below:

"Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over King (US 5,971,468) in view of Frankhouse, et al. (US 5,040,120).... Taking the teaching of King and Frankhouse together as a whole, it would have been obvious to one of ordinary skill in the art to modify the camera (96) of Frankhouse into the system of King for the same purpose of capturing a angle rear view of traffic or objects behind the vehicle . Doing would allow the driver see a various locations around the vehicle without turning his/her head around."

"Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Abersfelder et al (US 5,646,614).... Taking the teachings of Abersfelder et al and Aviv together as a whole, it would have been obvious to one of ordinary skill in the art to modify the pin hole lens of Aviv into the system of Abersfelder for the same purpose of seeing through the predetermined sized hole of license plate."

III
Grouping of Claims

Appellant contends that his two claims do not stand or fall together, and appellant later in this brief will explain in his arguments why the claims of the group are separately patentable.

IV
Arguments

It is important to put two quotes of the examiner, from his Final Detailed Action, next to each other. A copy of the Final Detailed Action is attached as Exhibit 1.

Quoting from page 2, line 10 under heading Claim Rejections -

"Re claim 3, King discloses an assembly of a camcorder-type liquid crystal display monitor (26 of Fig.1) is mounted to the inner retracted side of a driver sunvisor (24 of fig.1) of a vehicle (20 of fig.1) when the sunvisor is lowered allows a driver easily direct, close-range, sunlight-protected viewing of the monitor screen, the display monitor is connected to a navigation system to display a navigation information."

Quoting from page 2, line 1 under heading Response to Arguments:

"Applicant's arguments with respect to claims 3 and 4 have been considered but are moot in view of the new ground(s) of rejection." (Emphasis added.)

The inference that appellant draws from these two statements is that the examiner determined that King and appellant's invention are the same. Such inference is necessary to comprehend why the examiner said all of applicant's arguments were moot, when applicant's first argument was that King was inoperable as prior art because applicant's filing date of his provisional patent application came before the filing date listed for King.

Below, the appellant will show that the examiner erred in making the determination that King and appellant's invention are the same:

A. Examiner erred in stating that the display in King was "a camcorder-type liquid crystal display monitor."

It is common knowledge that a camcorder-type LCD monitor shows motion pictures. In order to determine what the display

of King shows, appellant attaches as Exhibit 2, a copy of King and quotes from the section covering the background of the invention, on page 3, starting at line 1:

"This invention relates to a combined vehicle sunvisor and display panel.

"Vehicles are being supplied with more and more displays to provide information to an operator. As an example, information with regard to the current operating condition of the vehicle, such as speedometer, fuel gauge, oil temperature, etc. have historically been provided to a vehicle operator. More recently, new products such as vehicle navigation systems have provided additional information to the operator.

The increase in the amount of information provided to the operator has resulted in a situation wherein there are many display areas on the instrument panel of the vehicle. Many of these areas are in a location wherein the driver must look away to access the information, such that the driver's attention is not on the road."

In summary, the display in King shows numbers, letters, symbols to replicate data that appears on the dashboard.

Appellant will show that a camcorder-type liquid crystal display monitor is a special type of LCD that evolved from the electronic viewfinder of a video camera, and that it is structurally different from the display of King.

Appellant will show that the term "camcorder-type liquid crystal display monitor" in appellant's claim 3 differentiates appellant's invention from King.

Quoting from the scientific book, Newnes Television and Video Engineer's Pocket Book, Third Edition, by Eugene Trundle, Newnes Publishing, Oxford, 1999 (pages of which are attached as Exhibit 3), on page 148, starting at line 1, under the heading Viewfinder:

"The camera's electronic viewfinder (EVF) has three main functions .... and it acts as picture monitor during in-the-field playback in the case of a camcorder...."

Quoting again at lines 26-28, at the bottom of page 148:

"Although physically very small, the components and techniques of the EVF are just the same as are used in the TV receiver and monitors covered in the first half of this book."

Quoting again, at the top of page 149, starting at line 1:

"The fact that colour viewfinders struggle to do justice to the performance of a good video camera has not prevented manufacturers incorporating them in home-movie camcorders! A few models offer the best of both worlds, with a conventional black-and-white VF tube plus a small (4-10 cm diagonal) colour LCD display in a fold out panel on one side of the camcorder body."

Quoting at page 9, titled Chapter 2, TV and Video Waveform and Standards, lines 7-10:

"For moving pictures it is necessary to present a series of frames at a rate which will fool the human eye into believing that it perceives continuous movement; and which avoids noticeable flicker."

Quoting at page 10, lines 12-14:

"Taking the European 625/50 standard as an example, then, the requirement is for the picture to 'light up' 50 times per second to avoid a bad flicker effect." (Emphasis added.)

Quoting from the scientific book, Practical Electronics for Inventors, by Paul Scherz, McGraw-Hill Publishing, New York, 2000, (pages of which are attached as Exhibit 4), at page 515, lines 1-3:

"A number of displays can be interfaced with control logic to display numbers, letters, special characters, and even graphics. Two popular displays that we'll consider here

include the light-emitting diode (LED) display and the liquid-crystal display (LCD)..." (No mention of showing movies.)

Quoting at page 521, lines 10-11, and continuing at page 522, line 1:

"One disadvantage with LCD's is their slow switching speeds (time it takes for a new digit/character to appear) Typical switching speeds for LCD's range from 40 to 100 ms."

The abbreviation for millisecond is ms. One millisecond is 1000th of a second. 40 ms equals 1/25th of a second, which is the fastest speed that a typical LCD display can change to a new digit/character.

The camcorder-type LCD monitor, although very small, uses the components and techniques of a TV receiver. It shows a picture of the content of the whole screen at least 50 times a second, or once in 1/50th of a second.

Showing motion pictures on the display of King would distract the driver from looking at the road. The display of King does not show motion pictures, and it cannot show motion pictures because its internal structure is not built like a TV receiver.

B. The examiner erred in stating that the display in King was a liquid crystal display monitor.

The examiner made this statement in his Final Detailed Action, page 2, line 10 under heading Claim Rejections, said page attached as part of Exhibit 1.

Quoting from the text of King (copy of which is attached as Exhibit 2), page 3, column 2, lines 47-48:

"The display panel is preferably of the reconfigurable type such as LED, LCD, ELD, etc."

Note that King put LCD second in a line behind LED, among three or more choices.

So, it is inaccurate for the examiner to state that the display in King was a liquid crystal display monitor. It is not

necessarily so.

This examiner is pushing too hard to make the appellant's display the same as King.

C. The examiner erred in concluding that appellant's invention was the same invention as King.

This conclusion is inferred by the examiner's statement, noted above, that the display of King was a camcorder-type liquid crystal display monitor....,

And by the examiner's statement, also noted above, that "Applicant's arguments with respect to claims 3 and 4 have been considered but are moot in view of the new ground(s) of rejection." (Emphasis added.)

Quoting from the text of King, page 3, column 1, line 51:

"The present invention provides information to the operator directly vertically above the operator's line of sight to the traffic. Thus, the operator need only look slightly vertically upwardly. The panel is preferably incorporated into the visor. The information is of the type a driver may reference while driving forwardly, as opposed to backing up." (Emphasis added.)

This quote was from the specification. Now let us look at the claims: From the text of King, page 4, column 2, line 16:

"6. A sunvisor as recited in claim 1, wherein said display panel displays information which a driver will access while driving forwardly." (Emphasis added.)

It is very clear that King's claim pertains only while the vehicle is driving forward, "as opposed to backing up."

Appellant's claims relate only to backing up. So, it would be impossible for appellant's invention to infringe on King. King has staked out the moving forward ground, and expressly showed no interest in the backing of a vehicle, leaving this area open, to whomever wants to deal with backing up only.

It is grossly unjust for this examiner to conclude that appellant's invention is the same as King.

D. Examiner erred in not finding King inoperable as prior art, after appellant gave notice that King's filing date was after appellant's filing date for provisional patent application.

Quoting from applicant's response to the First Office Action, page 3, lines 3-7 (attached as Exhibit 5):

"1. Inoperative Reference: In regard to King, the applicant respectfully submits that this reference is ineffective, because the applicant has an earlier effective filing date, due to his Provisional Patent Application 60/071/830, filed January 20, 1998."

The copy of the patent of King, which is attached as Exhibit 2, shows that the filing date was June 16, 1998.

Attached as Exhibit 6 is copy of the appellant's covering letter for filing of the patent application, and in the covering letter this statement appears:

"Pursuant to 35 U.S.C., 119(e)(i), applicant(s) claim priority of Provisional Patent Application Ser. Nr. 60/071,830, filed 1/20/98."

Attached as Exhibit 7 is copy of the Filing Receipt for appellant's patent application showing filing date of 01/15/99, and a statement on the Filing Receipt is as follows:

"Continuing data as claimed by Applicant - Provisional Application No. 60/071,830, 01/20/98.

E. Examiner erred in his conclusion that, "Taking the teachings of King and Frankhouse together as a whole, it would have been obvious to one of ordinary skill in the art to modify the camera (96) of Frankhouse into the system of King for the same purpose of capturing a angle rear view of traffic or objects behind the vehicle."

1. Quoting from the text of King, page 3, column 2, line 30:

> "The information displayed is of the sort which a driver will need to access while driving forwardly. This is contrasted to information only valuable while backing up, such as collision avoidance information. While backing up information displayed on the sunvisor does not assist the operator in not looking away from the driving position." (Emphasis added.)

To whomever wrote this specification, clearly the appellant's invention was not obvious to the responsible parties, Joseph D. King, the inventor, and his "attorney, agent, or firm - Howard & Howard," named in the text of King, page 1.

Here we have a person, or persons, with more than ordinary skill in the art to which said subject matter pertains.

The person filed for an invention of a display mounted on a sunvisor, who had knowledge fresh in his mind about the parameters of his invention, in the same general area as the appellant's invention; and yet this inventor, and his attorney, agent, or firm (all of whom would be professionals) failed to see the appellant's invention of using a sunvisor mounted camcorder-type liquid crystal display monitor to see while backing up.

This is very strong evidence that the appellant's invention is not obvious.

2. Regarding Frankhouse, etal (copy of which is attached as Exhibit 8), their invention consists of an LCD monitor mounted against the interior surface of the roof of a vehicle, on the extreme left side, the extreme right side or in the middle, as opposed to mounting on the driver's sunvisor; and this monitor is shown in Frankhouse drawings (fig.2 and fig.3); and one of the stated uses of this monitor is to see while backing up.

As Fig.3 and Fig.4 show, this mount to the roof of the vehicle is structurally very different from the appellant's sunvisor mount.

3. The appellant's sunvisor-mounted camcorder-type liquid crystal display monitor is an improvement over Frankhouse, etal, because it allows a direct line of vision, as opposed to an angled view.

When backing to a specific point in a narrow passageway for backing, which is common in the trucking industry, the direct, line-of-sight viewing is a useful improvement.

The appellant's back-up kit includes a reversal switch, that reverses the image that the camera sees looking backwards, so that it is as if the driver were looking directly into a rear-view mirror, as he is backing. The appellant's monitor assembly makes it easier for new drivers to learn to back with skill; and there is at present a shortage of skilled truck drivers.

4. In the appellant's invention, when the sunvisor is pulled down, the monitor is completely protected from bright sunlight coming through the windshield. Bright sunlight fades a monitor picture.

Whereas, in Frankhouse, etal, the display does not have protection from sunlight coming in the windshield. Because of the way the corner-mounted display is angled, sunlight will hit its screen and fade the picture, or produce glare. Thereby, appellant's invention is an improvement over Frankhouse, etal.

5. There is a surprising and unexpected advantage of the appellant's sunvisor mount, over the Frankhouse interior roof mount, at the far left, at the far right, or at the middle.

Quoting from Consumer Report magazine, July 2001, in an article comparing LCD flat panel monitors with standard CRT (cathode ray tube) monitor, page 49, column 3, line 10, in square at lower right: (Said reference is attached as Exhibit 9.)

> "Unless viewly nearly straight on, flat-panels lose much of their contrast... (Emphasis added.)
>
> "A CRT's pixels are illuminated differently, producing a softer image viewable from virtually any angle."

Therefore, the appellant's sunvisor-mounted, camcorder-type LCD monitor assembly is a great improvement over the extreme left side, right side, or middle roof-mounted LCD monitor of Frankhouse, because appellant's invention allows line-of-sight, direct view to the back, without lost of picture contrast, ie, fading, which would occur if one is looking at an LCD screen from an angle.

6. The essense of the King invention was that the sunvisor-mounted display allowed the driver to view information (information also appearing on the dashboard to his lower right) pertaining to operation of the vehicle, while keeping his eyes on the road while only looking slightly upward at the sunvisor-mounted display, and not having to look away from the road to view the dashboard to his lower right.

In summary, in King, the driver can look toward the road ahead, not having to look away. The U.S. Patent Office granted King a patent.

In appellant's invention, the driver can look directly ahead and see what is directly behind, not having to look away. The same standard should be applied to the appellant's invention, as was applied in King.

7. If the appellant's sunvisor-mounted, camcorder-type LCD monitor assembly were in fact obvious, because of its advantages noted above, those skilled in the art surely would have implemented it. That is -- the fact that those skilled in the art have not implemented the invention, despite its great advantages, indicates that it is not obvious.

F. Examiner erred in his conclusion that, "Taking the teachings of Abersfelder et al and Aviv together as a whole, it would have been obvious to one of ordinary skill in the art to modify the pin hole lens of Aviv into the system of Abersfelder for the same purpose of seeing through the predetermined sized hole of license plate."

1. License plates already have drilled holes, on the corners, for bolts to pass through. Drilling a hole through the center of a license plate is unusual.

Furthermore, the drilled hole has to be ground down on the back side, to eliminate all traces of rough edges.

For maximum concealment of the micro-video, pinhole lens camera, the camera needs to be glued to the plate, not bolted.

The glue is ideal to set a tight seal between the camera lens housing and the rear of the license plate. But unforeseen problems arise which will make persons think twice before mounting a pinhole lens camera on the back of a license plate.

The glue, or glues, chosen must make a waterproof seal and must hold the seal during extremes of cold and heat. Many glues accomplish one end, but not the other.

Unless one is careful, applying too much glue can spread the glue over the tiny pinhole lens opening, causing havoc.

Glues capable of holding a waterproof seal and of holding during extremes of heat and cold will bond so that the pinhole lens camera can never be removed from the back of the license plate, without damage to the camera.

Although nowadays, states do not issue yearly changes of license plates, and vehicles keep the same plates for years, the consequences of not being able to remove the camera would keep the ordinary person versed in the art from rushing to mount a micro-video, pinholed lens camera on the back of a trailer license plate. This just is not an obvious thing to do.

Only those who appreciate the risk of vandalism of an exotic looking gadget, mounted in plain sight, on the back of a freight trailer, frequently parked unattended in urban, industrial areas, will see that the concealment afforded the plate-mount helps to solve a longstanding problem in the trucking industry -- safe, easy, accurate backing without using a gadget that will attract vandals. And concealment is not easy. The camera must be hidden behind something thin, so the field of view is not overly diminished, and the concealing surface must be something ordinary, like a license plate.

2. A copy of Abersfelder, etal (US 5,940,120) is attached as Exhibit 10.

(a) Its camera system is greatly different in structure and much more complex than the appellant's plate-mounted, pinholed lens micro-video camera.

(b) In order for the camera to swing back and forth in an arc, part of the camera is exposed to anyone's view at the back of the car. The camera is not the pinhole type. Also, the side distance detecting sensors are exposed.

These features are shown in fig.2 (21.1 and 21.2 distance detecting sensors, 20.A and 20.B bounding beams, and 11 camera).

(c) The camera system is designed for an expensive car, like a Mercedes Bens (the car company is the assignee), that normally will be parked at night in a garage, not outdoors in an urban, industrial area where vandalism is a problem.

(d) Appellant's invention has advantages over Abersfelder, in that it is simple, suitable for the trucking industry, and conceals the camera behind the rear license plate of a freight trailer. The license plate is so commonplace that it does not draw attention, and yet the plate is thin enough to allow a wide field of view for the concealed pinhole camera lens.

Nothing else at the back of a freight trailer, at the ideal height/center position has these two requisites.

This ideal height/center position allows the camera a direct view to the loading platform.

This direct, line-of-sight view is especially important when a tractor/trailer rig is backing up to a loading dock that is fairly close to the street. The trailer may be in the driveway, facing south, while the tractor is still in the street facing east, for example. Yet with appellant's invention, the driver can clearly see what is directly behind his trailer, facing south. This is really an astounding improvement.

3. A copy of Aviv (US 5,666,157) is attached as Exhibit 11. In his Final Detailed Action the examiner referred to column 9, lines 54-65 of Aviv.

(a) Aviv has to do with a pinhole lens camera attached, eg,

to the rear view mirror in the driving compartment of a car, and it takes a picture of a thief in the front seat who is trying to steal the car, and it transmits this picture to police headquarters.

Aviv is a far cry from the appellant's simple invention to conceal a pinholed lens micro-video camera at the back of a freight trailer.

Appellant contends an ordinary person skilled in the art would not think of appellant's invention after being exposed to Aviv and Abersfelder.

4. If the appellant's plate-mounted, pinholed lens micro-video camera assembly, at the back of a freight trailer, were in fact obvious, because of its advantages noted above, those skilled in the art surely would have implemented it. That is -- the fact that those skilled in the art have not implemented the invention, despite its great advantages, indicates that it is not obvious.

All the Exhibits, 1-11, are incorporated by reference into this brief.

In regard to Grouping of claims, noted on page 2 of this brief, explanation is given as follows:

Appellant considers that his two claims are independent claims but that they complement each other.

Each claim provides a phrase that links it to the other claim. To wit: "when used in conjunction with a video camera", and "when used in conjunction with a monitor".

The term Kit in the title of the invention implies more than one compontent.

The appellant notes that in Abersfelder, etal, attached as Exhibit 10, the one patent covers both a camera at the back of the vehicle and a monitor in the middle console area of the driving compartment.

WHEREFORE, appellant prays that the Board will rule in

appellant's favor, and instruct the examiner to proceed with the issuing of a patent to the appellant, including the two claims fought for by the appellant.

Very respectfully submitted,

Rolf Jansen

Rolf Jansen
Appellant, pro se
P. O. Box 73161
Houston, TX 77273-3161

281-440-6907

Certificate of Mailing

I certify that this correspondence will be deposited with the United States Postal Service as first class mail with proper postage affixed in an envelope addressed to "Assistant Commissioner for Patents, Washington, DC 20231" on the date below.

Date: 08/27/01 Rolf Jansen Appellant

Rolf Jansen

Appellant's claims are:

3. An assembly of a camcorder-type liquid crystal display monitor, comprising means for mounting said assembly to the inner retracted side of a driver's sunvisor of a motor vehicle,

whereby said sunvisor, when lowered, allows a driver easy, direct, close-range, sunlight-protected viewing of said monitor screen, as if the screen were a rear-view mirror, when used in conjunction with a video camera, to see to the rear when the unaided view is obstructed.

4. An assembly of a micro-video, pin-holed lens camera, comprising means for mounting said assembly on the reverse side of a plate, such as a license plate, at the rear of a trailer or motor vehicle, so that said camera can see through a predetermined-sized hole put in said plate,

whereby said plate-mounted assembly conceals said pin-holed lens camera to lessen the risk of vandalism,

whereby said camera is located in the ideal position at the rear of a trailer or motor vehicle for viewing a backing, when used in conjunction with a monitor.

the Federal Circuit or for commencing a civil action.

(e) Jurisdiction over the application or patent under reexamination passes to the Board of Patent Appeals and Interferences upon transmittal of the file, including all briefs and examiner's answers, to the Board. Prior to the entry of a decision on the appeal, the Commissioner may sua sponte order the application remanded to the examiner.

(35 U.S.C. 6, Pub. L. 97–247; 15 U.S.C. 1113, 1123)

[46 FR 29183, May 29, 1981, as amended at 49 FR 555, Jan. 4, 1984; 49 FR 48453, Dec. 12, 1984; 54 FR 29552, July 13, 1989; 58 FR 54510, Oct. 22, 1993; 62 FR 53196, Oct. 10, 1997]

§ 1.192 Appellant's brief.

(a) Appellant must, within two months from the date of the notice of appeal under § 1.191 or within the time allowed for reply to the action from which the appeal was taken, if such time is later, file a brief in triplicate. The brief must be accompanied by the fee set forth in § 1.17(c) and must set forth the authorities and arguments on which appellant will rely to maintain the appeal. Any arguments or authorities not included in the brief will be refused consideration by the Board of Patent Appeals and Interferences, unless good cause is shown.

(b) On failure to file the brief, accompanied by the requisite fee, within the time allowed, the appeal shall stand dismissed.

(c) The brief shall contain the following items under appropriate headings and in the order indicated below unless the brief is filed by an applicant who is not represented by a registered practitioner:

(1) *Real party in interest.* A statement identifying the real party in interest, if the party named in the caption of the brief is not the real party in interest.

(2) *Related appeals and interferences.* A Statement identifying by number and filing date all other appeals or interferences known to appellant, the appellant's legal representative, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) *Status of claims.* A statement of the status of all the claims, pending or cancelled, and identifying the claims appealed.

(4) *Status of amendments.* A statement of the status of any amendment filed subsequent to final rejection.

(5) *Summary of invention.* A concise explanation of the invention defined in the claims involved in the appeal, which shall refer to the specification by page and line number, and to the drawing, if any, by reference characters.

(6) *Issues.* A concise statement of the issues presented for review.

(7) *Grouping of claims.* For each ground of rejection which appellant contests and which applies to a group of two or more claims, the Board shall select a single claim from the group and shall decide the appeal as to the ground of rejection on the basis of that claim alone unless a statement is included that the claims of the group do not stand or fall together and, in the argument under paragraph (c)(8) of this section, appellant explains why the claims of the group are believed to be separately patentable. Merely pointing out differences in what the claims cover is not an argument as to why the claims are separately patentable.

(8) *Argument.* The contentions of appellant with respect to each of the issues presented for review in paragraph (c)(6) of this section, and the basis therefor, with citations of the authorities, statutes, and parts of the record relied on. Each issue should be treated under a separate heading.

(i) For each rejection under 35 U.S.C. 112, first paragraph, the argument shall specify the errors in the rejection and how the first paragraph of 35 U.S.C. 112 is complied with, including, as appropriate, how the specification and drawings, if any,

(A) Describe the subject matter defined by each of the rejected claims,

(B) Enable any person skilled in the art to make and use the subject matter defined by each of the rejected claims, and

(C) Set forth the best mode contemplated by the inventor of carrying out his or her invention.

(ii) For each rejection under 35 U.S.C. 112, second paragraph, the argument shall specify the errors in the rejection and how the claims particularly point

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Office Action Summary	Application No.	Applicant(s)	
	09/232,566	JANSEN, ROLF	
	Examiner	Art Unit	
	Tung T. Vo	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) *3 and 4* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *3 and 4* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

Attachment(s)

15)☒ Notice of References Cited (PTO-892)
16)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
17)☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
18)☐ Interview Summary (PTO-413) Paper No(s). _____ .
19)☐ Notice of Informal Patent Application (PTO-152)
20)☐ Other: .

DETAILED ACTION

Drawings

The corrected or substitute drawings were received on 9/6/00. These drawings are approval.

Response to Arguments

1. Applicant's arguments with respect to claims 3 and 4 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over King (US 5,971,468) in view of Frankhouse et al. (US 5,940,120).

`Re claim 3, King discloses an assembly of a camcorder-type liquid crystal display monitor (26 of fig. 1) is mounted to the inner retracted side of a driver sunvisor (24 of fig. 1) of a vehicle (20 of fig. 1) when the sunvisor is lowered allows a driver easily direct, close-range, sunlight-protected viewing of the monitor screen, the display monitor is connected to a navigation system to display a navigation information.

It is noted that King discloses the display monitor is connected to the navigation system but King fails to particularly connect to a video camera to see to the rear when the unaided view

is obstructed. However, Frankhouse teaches a LCD display (90 of fig. 6) is mounted to the compartment (124 of fig. 6) of the vehicle to display information of a rear view captured by a video camera (96 of fig. 10). Taking the teachings of King and Frankhouse together as a whole, it would have been obvious to one of ordinary skill in the art to modify the camera (96) of Frankhouse into the system of King for the same purpose of capturing a angle rear view of traffic or objects behind the vehicle. Doing would allow the driver see a various locations around vehicle without turning his/her head around.

3. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Aberfelder et al. (US 5,646,614).

Re claim 4, Abersfelder discloses a camera (11 of fig. 1) is built in and located on the back of a car (10 of fig. 1), whereby said camera is located in the ideal at rear of the car for viewing a backing and connected to a monitor (15 of fig. 1), and wide angle lenses are used in this particular camera to receive a wide view image. It is noted that Abersfelder fails to particularly disclose the camera is mounted on the reverse side of a license plate at the rear of vehicle so that the camera can see through a predetermined-sized whole put in the license plate. However, it is well established that one skilled in the art would have obvious to mount the camera anywhere on the car, particularly on the reverse side of a license plate at the rear of the vehicle, and the camera can see through a predetermined-sized hole put in the license plate a rear view when the vehicle is backing.

Abersfelder further teaches any conventional and suitable camera lenses, camera lenses of very compact construction can be used, without the requirement of extending the camera purposes of realizing a sufficient viewing angle (col. 2, lines 16-25). However, Abersfelder does

not particularly disclose a pin hole lens which is used for a camera. Aviv teaches a pin hole lens is used for a camera (col. 9, lines 54-65). Taking the teachings of Abersfelder et al and Aviv together as a whole, it would have been obvious to one of ordinary skill in the art to modify the pin hole lens of Aviv into the system of Aberfelder for the same purpose of seeing through the predetermined sized hole of license plate.

Conclusion

4. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

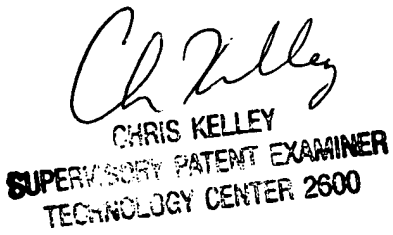
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tung T. Vo whose telephone number is (703) 308-5874. The examiner can normally be reached on M-F 7:30AM-4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chris Kelley can be reached on (703) 305-4856. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-6306 for regular communications and (703) 308-6306 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4700.

Tung T. Vo
Examiner
Art Unit 2613

T.vo.
January 23, 2001



(3)

Newnes Television and Video Engineer's Pocket Book

Third edition

Eugene Trundle, TMIIE (elect), MRTS, MISTC

Newnes

OXFORD AUCKLAND BOSTON
JOHANNESBURG MELBOURNE NEW DELHI

US005971468A

United States Patent [19]

King

[11] Patent Number: 5,971,468

[45] Date of Patent: Oct. 26, 1999

[54] **INCORPORATION OF VEHICLE DISPLAY INTO VEHICLE SUNVISOR**

[75] Inventor: **Joseph D. King**, Ann Arbor, Mich.

[73] Assignee: **UT Automotive Dearborn, Inc.**, Dearborn, Mich.

[21] Appl. No.: **09/098,084**

[22] Filed: **Jun. 16, 1998**

[51] **Int. Cl.**[6] **B60J 3/00**

[52] **U.S. Cl.** **296/97.5**

[58] **Field of Search** 296/97.5

[56] **References Cited**

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Advertisement for Audiovox Specialized Applications; *LCD Rear Observation System.*

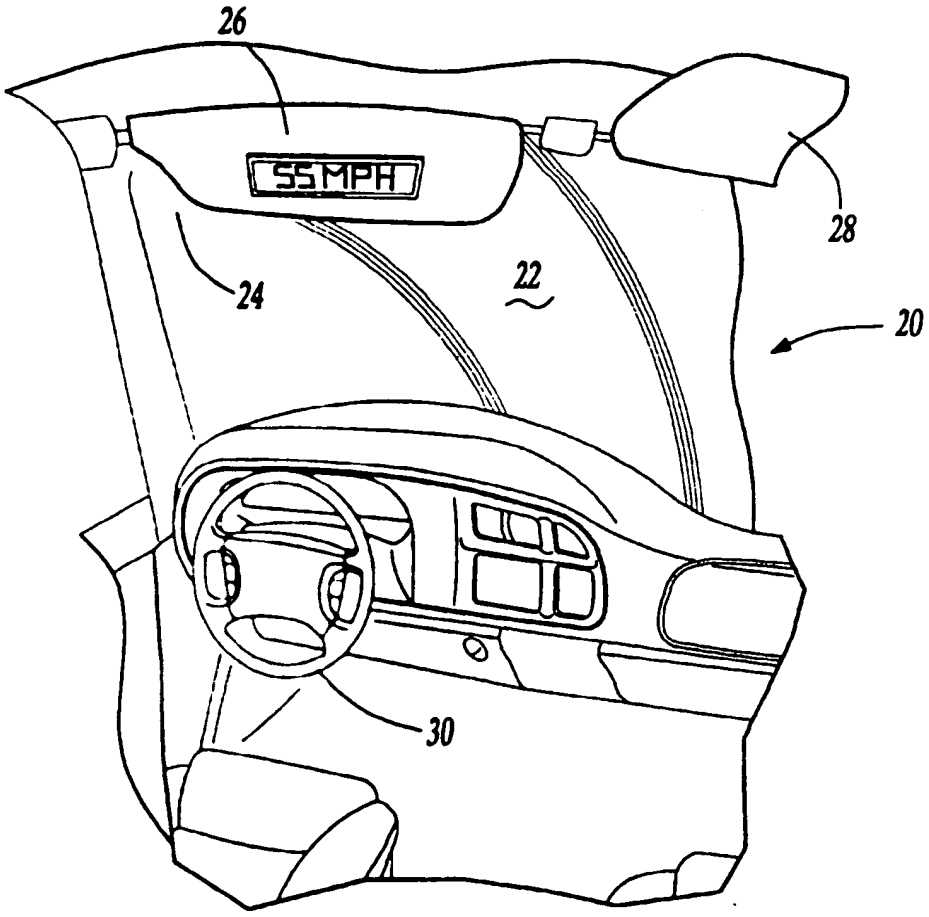
Primary Examiner—Gary C. Hoge

Attorney, Agent, or Firm—Howard & Howard

[57] **ABSTRACT**

A display panel for displaying information to a vehicle operator is placed on a rear surface of a sunvisor for the vehicle. The display panel is hidden when the sunvisor is moved to a stowed position but is easily accessible to the operator when the sunvisor is moved to its extended position. The location of the display panel on the sunvisor allows the operator easy access to the information without diverting information from the road. In addition, control buttons are associated with the display panel such that the operator is able to adjust the information displayed on the panel, or to adjust a component for responding to the information displayed on the panel.

6 Claims, 1 Drawing Sheet



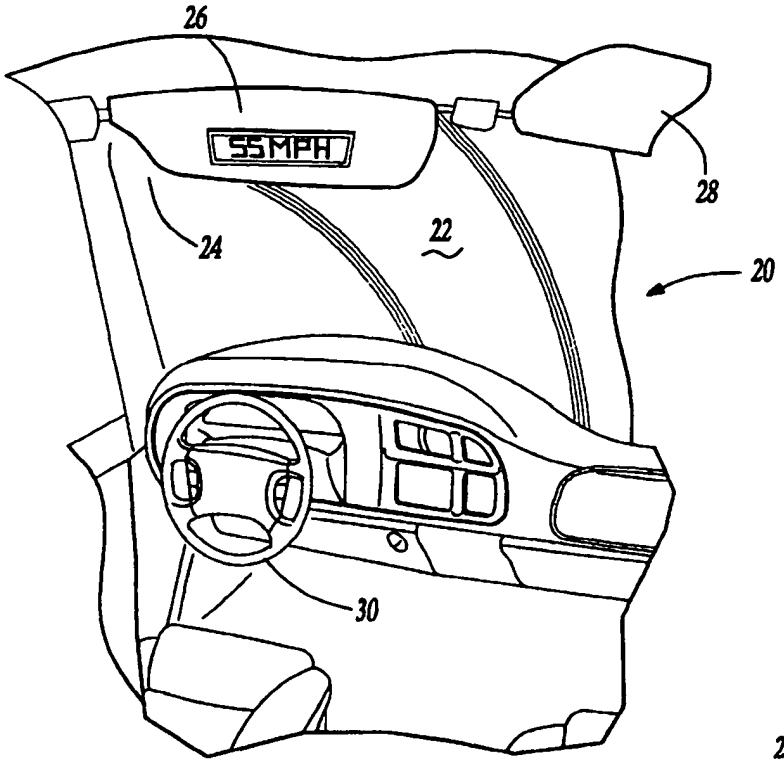


Fig-1

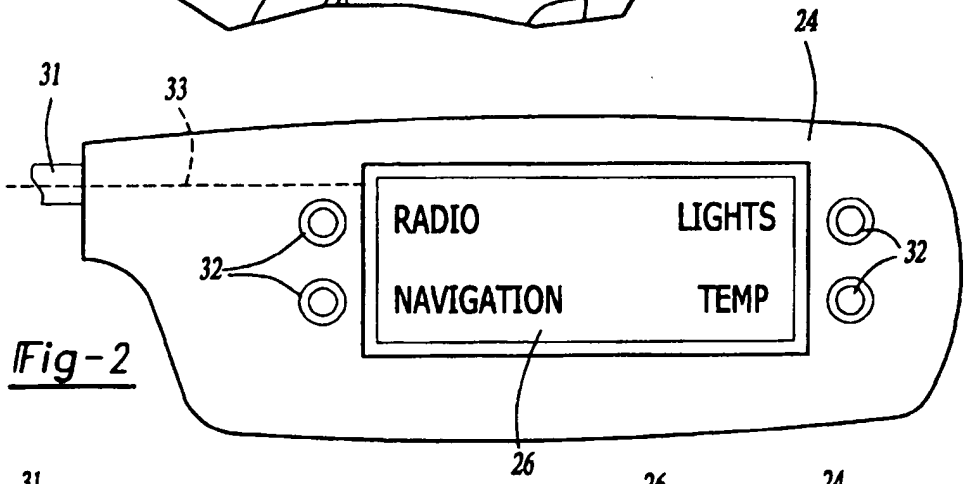


Fig-2

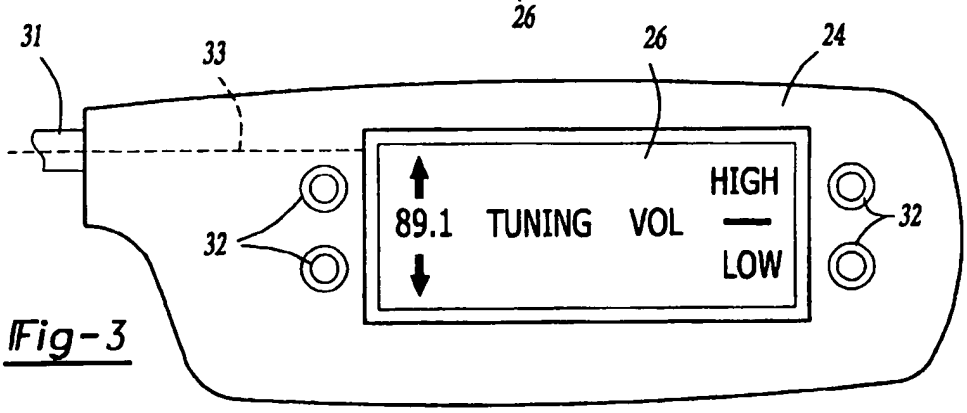


Fig-3

INCORPORATION OF VEHICLE DISPLAY INTO VEHICLE SUNVISOR

BACKGROUND OF THE INVENTION

This invention relates to a combined vehicle sunvisor and display panel.

Vehicles are being supplied with more and more displays to provide information to an operator. As an example, information with regard to the current operating condition of the vehicle, such as speedometer, fuel gauge, oil temperature, etc. have historically been provided to a vehicle operator. More recently, new products such as vehicle navigation systems have provided additional information to the operator. Further, environmental control systems such as temperature, air conditioning, lights, radio and other entertainment information are also provided to the operator.

The increase in the amount of information provided to the operator has resulted in a situation wherein there are many display areas on the instrument panel of the vehicle. Many of these areas are in a location wherein the driver must look away to access the information, such that the driver's attention is not on the road.

Many of the prior art display panels are in a location where the operator must look away from the road in more than one axes. As an example, many display panels are positioned spaced towards the passenger seat from the driver, and at a vertical location beneath the windshield. Thus, the operator must look vertically downwardly, and to the right to see the information.

Moreover, many of these displays are associated with control buttons to change the state of the information displayed (i.e., radio volume, etc.). Again, if the operator's attention is diverted from the road to control these switches, the results may be undesirable.

It is therefore an object of this invention to provide an information display and associated control that does not remove the operator's line of vision from the road.

SUMMARY OF THE INVENTION

In a disclosed embodiment of this invention, a display panel is positioned on a rear surface of a sunvisor. The sunvisor is of the type which is pivoted downwardly into the driver's view, at a location adjacent the vertically upper end of the windshield. In this way, when the operator wishes to view information on the sunvisor, the sunvisor may be simply pivoted to the down position, and the information is directly in the line of sight of the operator. The operator may only need to look up slightly, and need not look to the side to gain access to the information.

The present invention provides information to the operator directly vertically above the operator's line of sight to the traffic. Thus, the operator need only look slightly vertically upwardly. The panel is preferably incorporated into the visor. The information is of the type a driver may reference while driving forwardly, as opposed to backing up.

In other preferred embodiments of this invention, control buttons to control the information displayed on the display panel are also provided adjacent to the display panel. These controls can also be provided by touch screen menu areas. As an example, the display buttons may be controls to adjust the level of volume for a radio, should the radio be the information displayed on the rear of the sunvisor. The controls necessary for achieving selective control of the information displayed are known. It is the inclusion of the display panel and the controls on the rear of the sunvisor which is the inventive feature of this application.

These and other features of this invention may be understood from the following specification and drawings, the following of which is a brief description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic view of a vehicle windshield.

FIG. 2 is an enlarged view of a sunvisor incorporated into the FIG. 1 vehicle windshield.

FIG. 3 is a view similar to FIG. 2, but showing a subsequent display.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

A vehicle cab **20** is shown in FIG. 1 incorporating a window glass **22** which shows the road line of sight to the operator. A sunvisor **24** is shown pivoted to a downward position, and a display panel **26** is shown in FIG. 1 on the rear of the sunvisor **24**. The display panel **26** is shown displaying speed information, such as typically displayed in the instrument panel. The front of the sunvisor faces outwardly of the vehicle and blocks sunshine into the vehicle.

The sunvisor **28** is pivoted to a stowed position, again as known. Visor **26** may also move to this stowed position.

The location of the steering wheel **30** gives a perspective of the location of the operator's line of sight. The sunvisor display panel **26** is in a location such that the operator need only avert his eyes slightly vertically upwardly to gain access to information displayed on panel **26**.

The information displayed is of the sort which a driver will need to access while driving forwardly. This is contrasted to information only valuable while backing up, such as collision avoidance information. While backing up information displayed on the sun visor does not assist the operator in not looking away from the driving direction.

As shown in FIG. 2, the sunvisor **24** incorporates the panel **26**. A pivot post **31**, which is well known in the art, passes electrical signals to and from the sunvisor. Wires **33** are shown schematically for transmitting this information to and from the display **26** and controls on the vehicle. Typically, the sunvisors have been provided with illuminated lights, but no display panel. Thus, the provision of electrical signals to and from the sunvisor is known. It is the use of the display panel with the signals passing through the pivot post which is unique in this invention. While control buttons **32** are shown, it should be understood that touch screen controls can be used. The display panel is preferably of the reconfigurable type such as LED, LCD, ELD, etc.

Controls, such as buttons **32** allow an operator to select what type of information is displayed, and also adjust variables. As an example, the operator may select from interior comfort options such as radio, lighting temperature, or navigation information. If the driver actuates the radio button as shown in FIG. 2, then the display moves to a radio control display, such as shown in FIG. 3. The operator can manipulate the buttons to select radio information to be displayed. The operator will then be able to adjust aspects of the radio such as volume or tuning. Thus, the operator is able to adjust the radio without diverting his attention from the road other than to look slightly vertically upwardly to the display panel **26**. The controls to achieve this adjustment are known, it is the provision of such features into the sunvisor which is inventive. Further, the displays illustrated in the Figures are simplified to allow early understanding of the basic concepts.

The present invention provides an additional area for display which is easily accessible to the operator, without

diverting attention from the road. The present invention thus is a great improvement upon the prior art. A worker of ordinary skill in the art would recognize that certain modifications come within the scope of this invention. For that reason, the following claims should be studied to determine the true scope and content of this invention.

What is claimed is:

1. A vehicle cab comprising

a front windshield, and at least one sunvisor, said sunvisor having a mount structure to be mounted to a roof of said vehicle, said sunvisor being pivotable between a stowed position wherein a first surface faces into said cab, and a second surface faces said ceiling, and said sunvisor being movable to a extended position wherein said second surface faces into said cab and said first surface faces outwardly through said windshield; and

a display panel being connected to said second surface, said display panel being connected to a control on said vehicle to display information relative to the operation of at least one component of said vehicle.

2. A vehicle cab as recited in claim 1, wherein said sunvisor is attached to said vehicle by a pivot post, and control wires extending through said pivot post to said display panel.

3. A sunvisor as recited in claim 1, wherein control switches are provided adjacent to said display panel to allow an operator to control information which is displayed on said display panel.

4. A sunvisor as recited in claim 1, wherein said display panel is a reconfigurable display panel.

5. A sunvisor as recited in claim 1, wherein signals wires extending to said display panel pass through a pivot post for said sunvisor.

6. A sunvisor as recited in claim 1, wherein said display panel displays information which a driver will access while driving forwardly.

* * * * *

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CONTENTS

DER

electrical joints, on PCBs and elsewhere, are made with solder, for general purposes is a 60/40 alloy of tin and lead with a ng point around 183°C. For applications where operating ·ratures may approach this, high melting point (HMP) solders ·ailable. Solders are generally prepared in wire form with one ›re internal cores of non-corrosive flux. For general servicing ›ses 18 or 22 s.w.g. is suitable, though finer grade (26 s.w.g.) is l for fine work and for rework of SM PCBs. Special-purpose rs also relevant to these are various preforms, and *solder paste*, iich tiny globules of solder are suspended in a semi-liquid flux lispensed onto the board as required during manufacture or r, in the latter case from a syringe. All soldering is accompanied uxing, the application of an agent (e.g. resin) to remove oxides the surfaces of both metals to be bonded.

CHAPTER 2

TV AND VIDEO WAVEFORMS AND STANDARDS

'Television' and 'video' are wide-ranging words. For our purposes, television means seeing over long distances by means of an electrical link, and video (in the everyday usage of the word) means a recording and playback system with which TV programmes can be stored on disc or magnetic tape for subsequent replay via a TV set or monitor. In analogue systems the picture information is conveyed as an electrical waveform. Since a single link between TV sender and receiver can only handle one signal at a time, and because a TV picture consists of many hundreds of thousands of individual picture elements, a scanning system is required at each end. At the sending end it breaks down the composite picture into separate picture elements which are then sequentially transmitted. At the receiving end this 'serial' video signal is used to modulate the light output of the display in order to recreate the original scene. Provided that the scanning system at the receiver runs in perfect synchronism with that at the transmitter the positioning of each picture element in the display will be correct, and a complete two-dimensional picture is built up.

The fidelity of the reproduced picture depends on many things. The scanning process consists of analysing the picture in terms of horizontal lines: the duration and number of these lines is the basic arbiter of picture definition and quality. Many other factors are present, such as the bandwidth of the entire video path from camera to picture tube; the screen structure of a colour display tube; the method of encoding the colour signal, and so on.

SCANNING STANDARDS

The number of horizontal scanning lines used in TV picture analysis is a fundamental characteristic of a TV *standard*. So far as line standards are concerned there are now only two in general broadcast use – 525 lines in the Americas, Greenland and Japan, and 625 lines elsewhere, including Eastern and Western Europe, Africa and Australia. More specific details appear later in this chapter. Of course the number of lines only describes how each *stationary* picture is analysed. For moving pictures it is necessary to present a series of frames at a rate which will fool the human eye into believing that it perceives continuous movement; and which avoids noticeable flicker. This depends for its success

on 'persistence of vision', that characteristic of the eye which retains an impression of an image for a fraction of a second after the object itself has disappeared. A series of still images presented at a rate of about 14 per second would provide an illusion of continuous movement, but would give rise to a very distracting flicker. Increasing the rate to 25 per second would reduce the effect but not eliminate it. A repetition rate of 50 per second is satisfactory for most purposes, though 60 is better, especially where the picture is bright. For historical reasons having to do with the frequency of the public electricity supply, 625 line systems generally have a 50 Hz field rate, while 525 line systems have a 60 Hz field rate.

Taking the European 625/50 standard as an example, then, the requirement is for the picture to 'light up' 50 times per second to avoid a bad flicker effect. Since 25 pictures per second are adequate to fulfil the continuous movement requirement, however, it would be wasteful of bandwidth and broadcast spectrum space to transmit 50 complete pictures per second. The problem is neatly solved by the adoption (universal for broadcast TV) of *interlaced* scanning. In this system, instead of transmitting each line of the picture in sequence (Fig. 2.1(a)) the first vertical scanning sweep is done at twice-speed, as it were. The left-to-right scan-line paths are double spaced as a result, and so only 312½ lines (half the total of 625) are traced out, corresponding to lines 1, 2, 3, 4 etc. in Fig. 2.1(b). The second vertical sweep, by virtue of a very precisely timed start point, scans the gaps left between the lines of the first field – lines A, B, C and D in Fig. 2.1(b). By this means, although only 25 complete pictures (*frames*) are presented per second, the entire screen is scanned 50 times (50 *fields*) per second. Since at normal viewing distances individual scanning lines are not perceptible, the effect is to secure a 50 Hz flicker rate while using no more video or spectrum bandwidth than required for a 25 fields/second sequentially scanned system.

THE VIDEO SIGNAL

A standard video signal is an electrical analogy of the brightness of the TV picture at the point on the screen being described at that instant. The brighter the picture-point the higher the voltage, with 'peak-white' – corresponding to maximum drive – being standardised at the level of +1 V. Black is standardised at 0.3 V (300 mV). All the levels of grey therefore fall between these two voltages, and where a lot of detail is present in the scene the video voltage will very quickly alternate between different levels, giving rise to high frequencies in the video waveform. The range of possible frequencies goes from zero

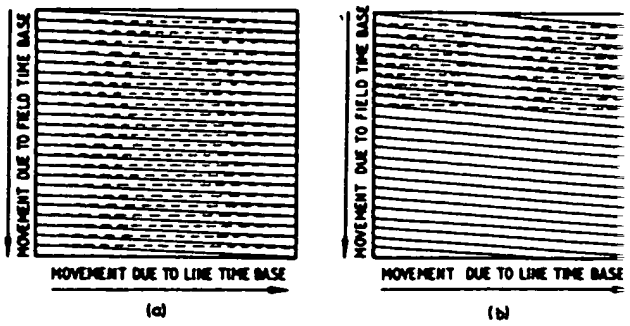

Fig. 2.1 *TV scanning: (a) sequential; (b) interlaced*

(d.c.) when an even tone (i.e. all black, all grey, all white etc.) is transmitted, up to about 5.5 MHz for a fine network of vertical and white bars. Three lines of a TV waveform are shown in Fig

Along with the video signal itself synchronising pulses must b to keep the scanning at the receiver in step with that in the ca The 'blacker than black' area between 0 V and 0.3 V is reserv sync pulses – two types are sent, one at 64 μs intervals to trigg line scan generator, and one at 20 ms intervals to synchronis scanning sweeps. In the receiver these pulses are stripped off the signal by an amplitude limiter (sync separator) and then spli line- and field-rate pulses by frequency (time)-conscious circui

A section of this basic waveform, showing one complete line p of 64 μs is shown in Fig. 2.3. It is made up of 52 μs of pi information and a 12 μs line blanking period. The time-refe point for the whole waveform is the beginning of the 4.7 μs lin pulse. Following the pulse is a 'back porch' period of 5.8 μs d which the waveform remains at black level. At the finish of p information comes a 'front porch' of 1.55 μs. This short bla

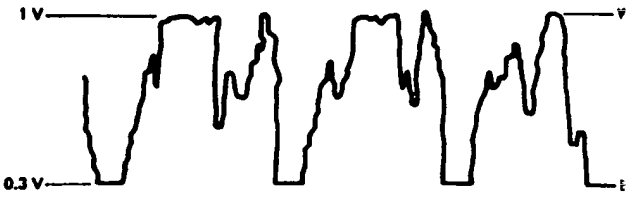

Fig. 2.2 *Basic video waveform. The voltage is analogous t strength of light*

and via mirrors. Not all scenes are amenable to auto-focusing; sometimes the main picture feature is not central in the frame, and sometimes a degree of defocusing of some or all of the televised scene is required for production or artistic effects. For these reasons, and to conserve battery power where applicable, the auto-focus facility can be switched off.

The current trend is to use the video signal itself as reference for the auto-focus system as shown in Fig. 6.11. It generally gives more accurate results, and permits a choice of zone sizes for focus sampling.

VIEWFINDERS

The camera's electronic viewfinder (EVF) has three main functions. It frames the shot for the operator and checks optical focus during shooting; it relays information from the camera's system-control section on settings, status and operational mode; and it acts as picture monitor during in-the-field playback in the case of a camcorder. It is difficult to manufacture a very small colour screen with good enough colour fidelity to accurately judge the picture hue, or with sufficient definition to permit accurate optical focusing, especially with high-band and digital cameras.

The norm, then, is a black-and-white viewfinder tube of about 2.5 cm diagonal mounted in a 'chicken-leg' housing hinged at its back end on the top surface of the camera. It has an eyepiece and viewing lens with focus adjustment. The display tube is necessarily a low-energy device with small deflection angle. As in larger picture tubes, magnetic deflection and electrostatic beam-focus systems are used. The VF tube is driven by what amounts to a complete monitor circuit, including video amplifier and output stage; sync separator; time-bases; and high-voltage supplies for the picture-tube, the whole being miniaturised and designed to operate from its own (typically 5 V) supply rail, derived from the camera's own power supply via a stabiliser/regulator circuit. No external controls are needed, though brightness and beam-focus controls may be provided as semi-accessible presets. This complete independence of the EVF system is necessary to enable the viewfinder to perform its role as a video monitor during tape replay when the camera section is switched off. Although physically very small, the components and techniques of the EVF are just the same as are used in the TV receiver and monitors covered in the first half of this book.

Colour EVF

The fact that colour viewfinders struggle to do justice to the perf
ance of a good video camera has not prevented manufact
incorporating them in home-movie camcorders! A few models
the best of both worlds, with a conventional black-and-white VF
plus a small (4–10 cm diagonal) colour LCD display in a fold
panel on one side of the camcorder body. In the *Viewcam* the
panel of the camcorder consists of a colour LCD panel of 8–1
diagonal. While suffering from the above-mentioned shortcom
as a camera viewfinder, it does have the advantages of not nee
to be held to the eye while shooting, and of affording more than
viewer (with difficulty!) to watch the playback on location. A
class of camcorder sports a conventional viewfinder housing, b
contains a mini-LCD panel in place of the little monochrome
again with an eyecup and lens. This stretches the cost versus perf
ance of LCD technology tight, and the 'chicken-wire overlay' e
on the VF image can be very obtrusive.

VIEWFINDER INDICATIONS

All feedback to the camcorder operator comes via the fiewfi
screen, composed and superimposed on the picture by a chara
generator IC, which may be incorporated in the main processor
Working on indications sent to the processor from sensors o
tape deck, in the camera section and elsewhere, the character ge
tor provides a wide range of status, indication and warning sym
plus – very often – a simple titling facility so that captions and
can be recorded on tape.

CAMCORDERS

Camcorders combine the camera principles described in this ch
with the videorecorder systems described in Chapters 13–19 o
book, and use miniature deck assemblies and (often) small
drums. They use either low- or high-band formats (see Chapte
and small cassettes of the Video 8 or VHS-C type. Hi-Fi stereo sc
either in f.m. or pulse-code form, is also incorporated in some m
Digital cameras will be dealt with in Chapter 19.

The requirements of small size, light weight and minimum p
consumption, together with competition between makers and fo
for the best performance and greatest sophistication, has put
corders in the forefront of electronic technology. Surface-mo

Colour EVF

The fact that colour viewfinders struggle to do justice to the performance of a good video camera has not prevented manufacturers incorporating them in home-movie camcorders! A few models offer the best of both worlds, with a conventional black-and-white VF tube plus a small (4–10 cm diagonal) colour LCD display in a fold-out panel on one side of the camcorder body. In the *Viewcam* the rear panel of the camcorder consists of a colour LCD panel of 8–10 cm diagonal. While suffering from the above-mentioned shortcomings as a camera viewfinder, it does have the advantages of not needing to be held to the eye while shooting, and of affording more than one viewer (with difficulty!) to watch the playback on location. A third class of camcorder sports a conventional viewfinder housing, but it contains a mini-LCD panel in place of the little monochrome tube, again with an eyecup and lens. This stretches the cost versus performance of LCD technology tight, and the 'chicken-wire overlay' effect on the VF image can be very obtrusive.

VIEWFINDER INDICATIONS

All feedback to the camcorder operator comes via the fiewfinder screen, composed and superimposed on the picture by a character-generator IC, which may be incorporated in the main processor chip. Working on indications sent to the processor from sensors on the tape deck, in the camera section and elsewhere, the character generator provides a wide range of status, indication and warning symbols, plus – very often – a simple titling facility so that captions and titles can be recorded on tape.

CAMCORDERS

Camcorders combine the camera principles described in this chapter with the videorecorder systems described in Chapters 13–19 of this book, and use miniature deck assemblies and (often) small head drums. They use either low- or high-band formats (see Chapter 14) and small cassettes of the Video 8 or VHS-C type. Hi-Fi stereo sound, either in f.m. or pulse-code form, is also incorporated in some models. Digital cameras will be dealt with in Chapter 19.

The requirements of small size, light weight and minimum power consumption, together with competition between makers and formats for the best performance and greatest sophistication, has put camcorders in the forefront of electronic technology. Surface-mounted

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It was set in Palatino by North Market Street Graphics.
Phoenix Color was printer and binder.

This book is printed on recycled, acid-free paper containing a minimum of 50% recycled, de-inked fiber.

APPENDIX I

Displays

A number of displays can be interfaced with control logic to display numbers, letters, special characters, and even graphics. Two popular displays that we'll consider here include the light-emitting diode (LED) display and the liquid-crystal display (LCD).

I.1 LED Displays

LED displays come in three basic configurations, numeric (numbers), alphanumeric (numbers and letters), and dot matrix forms (see Fig. I.1). Numeric displays consist of 7 LED segments. Each LED segment is given a letter designation, as shown in the figure. 7-segment LED displays are most frequently used to generate numbers (0–9), but they also can be used to display hexadecimal (0–9, A, B, C, D, E, F). The 14-segment, 16-segment, and special 4 × 7 dot matrix displays are alphanumeric, while the 5 × 7 dot matrix display is both alphanumeric and graphic—you can display unique characters and simple graphics.

Various types of displays

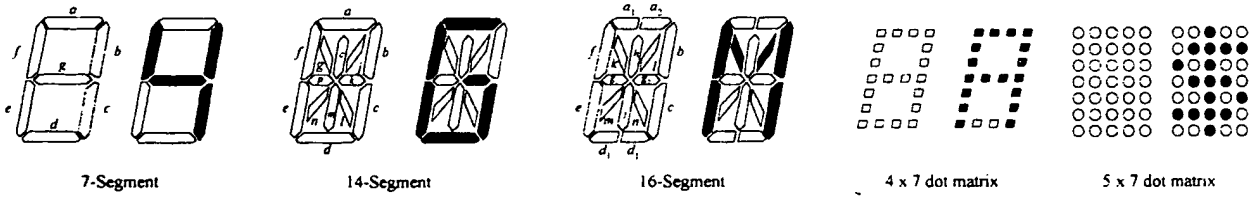
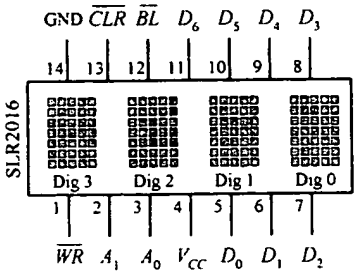


FIGURE I.1

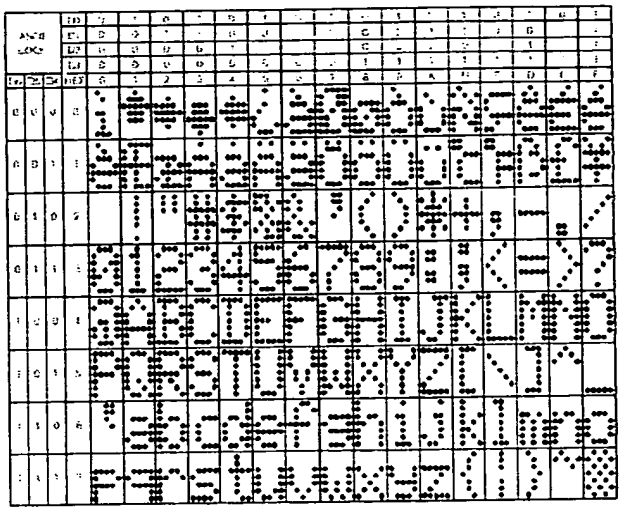
I.1.1 Direct Drive of Numeric LED Displays

Seven-segment LED displays come in two varieties, common anode and common cathode. Figure I.2 shows single digital 8-segment (7 digit segments + decimal point) displays of both varieties.

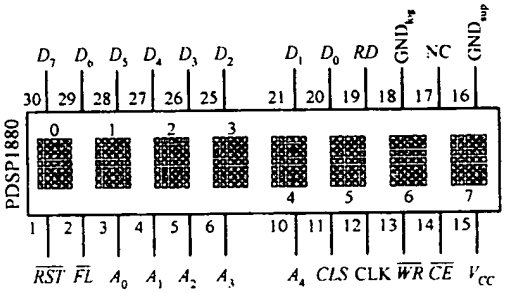
SLR2016 (Siemens) 4-Digit 5 x 7 Dot Matrix Alphanumeric Intelligent Display



SLR2016 Character Set



PDSP1880 (Siemens) 8-Character 5 x 7 Dot Matrix Alphanumeric Programmable Display



PDSP1880 Character Set

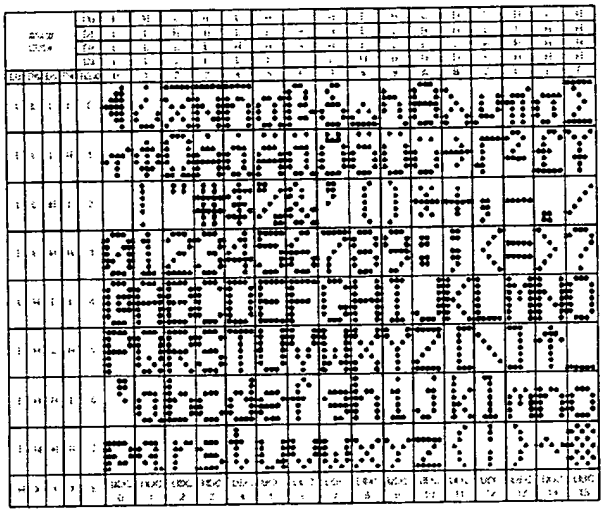


FIGURE I.9

I.3 Liquid-Crystal Displays

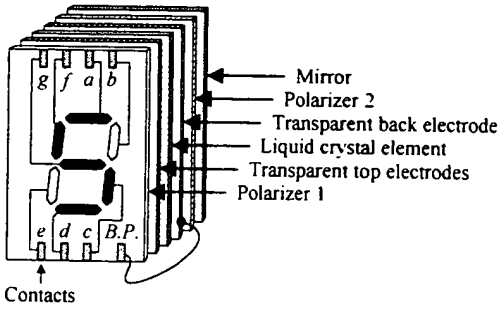
In low-power CMOS digital systems (e.g., battery- or solar-powered electronic devices), the dissipation of an LED display can consume most of a system's power requirements, something you want to avoid, especially since you are looking to save power when using CMOSs anyway. Liquid-crystal displays (LCDs), on the other hand, are ideal for low-power applications. Unlike a LED display, an LCD is a passive device. This means that instead of using electric current to generate light, it uses light that is already externally present (e.g., sunlight, room lighting). For the LCD's optical effects to occur, the external light source need only supply a minute amount of power (within the mW/cm^2 range).

One disadvantage with LCDs is their slow switching speeds (time it takes for a new digit/character to appear). Typical switching speeds for LCDs range from

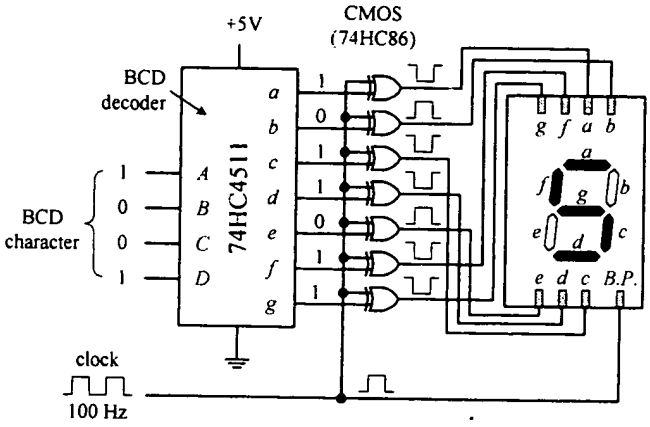
around 40 to 100 ms. At low temperature, the switching speeds get even worse. Another problem with LCDs is the requirement that external light be present. Though there are LCD displays that come with backlighting (e.g., LED behind the display), the backlighting alone tends to defeat attempts at keeping power consumption to a minimum.

I.3.1 Basic Explanation of How an LCD Display Works

An LCD display consists of a number layers that include a polarizer, a set of transparent electrodes, a liquid-crystal element, a transparent back electrode, a second polarizer, and a mirror. See leftmost figure below.



Cutaway view of a reflective-typeLCD



Example circuit showing how to drive LCD

FIGURE I.10

The transparent top electrodes are used to generate the individual segments of a digit, character, etc., while the transparent back electrode forms a common plane, often referred to as the *back plane* (BP). The top electrode segments and the back electrode are wired to external contacts. With no potential difference between a given top electrode and the back electrode, the region where the top electrode is located appears silver in color against a silver background. However, when a potential is applied between a given top electrode and back electrode, the region where the top electrode is located appears dark against a silver background.

The circuit in Fig. I.10 shows a simple way to drive a 7-segment LCD. It uses a 74HC4511 BCD decoder and XOR gates to generate the prior drive signals for the LCD. A very important thing to note in this circuit is the clock. As it turns out, an LCD actually requires ac drive signals (e.g., squarewaves) instead of dc drive signals. If dc were used, the primary component of the display, namely, the liquid crystal, would undergo electrochemical degradation (more on the liquid crystal in a moment). The optimal frequency of the applied ac drive signal is typically from around 25 Hz to a couple hundred hertz. Now that we understand that, it is easy to see why we need the XOR gates. As the clock delivers squarewaves to the back electrode (back plane, or BP), the XOR gates act as enable gates that pass and invert a signal and apply it to a given top electrode segment. For example, if a

ABOUT THE AUTHOR

Paul Scherz is a physicist/mechanical engineer who received his B.S. in physics from the University of Wisconsin. His area of interest in physics currently focuses on elementary particle interactions, or high-energy physics, and he is working on a new theory on the photon problems with Nikolus Kauer (Ph.D. in high-energy physics, Munich, Germany). Paul is an inventor/hobbyist in electronics, an area he grew to appreciate through his experience at the University's Department of Nuclear Engineering and Engineering Physics and the Department of Plasma Physics.

(5)

In the United States Patent and Trademark Office

Serial Number: 09/232,566

Appn. Filed: 01/15/99

Applicant(s): Rolf Jansen

Appn. Title: Tractor/Trailer Back-up Kit

Examiner/GAU: Tung Vo, Group Art Unit 2713

Mailed: January 2, 2001

At: Houston, TX

Amendment A

Assistant Commissioner for Patents

Washington, District of Columbia 20231

Sir:

In response to the Office Letter mailed August 2, 2000, please amend the above application as follows:

Claims: Cancel all claims of record and substitute new claims 3 and 4 as follows:

3. An assembly of a camcorder-type liquid crystal display monitor, comprising means for mounting said assembly to the inner retracted side of a driver's sunvisor of a motor vehicle,
whereby said sunvisor, when lowered, allows a driver easy, direct, close-range, sunlight-protected viewing of said monitor screen, as if the screen were a rear-view mirror, when used in conjunction with a video camera, to see to the rear when the unaided view is obstructed.

4. An assembly of a micro-video, pin-holed lens camera, comprising means for mounting said assembly on the reverse side of a plate, such as a license plate, at the rear of a trailer or motor vehicle, so that said camera can see through a predetermined-sized hole put in said plate,
whereby said plate-mounted assembly conceals said pin-holed lens camera to lessen the risk of vandalism,

whereby said camera is located in the ideal position at the rear of a trailer or motor vehicle for viewing a backing, when used in conjunction with a monitor.

REMARKS

Applicant wishes to thank the Examiner for sending the copies of the references.

Applicant submitted corrected drawings NO. 1-5 that were received in the Patent Office on August 30, 2000.

Applicant filed a Petition for Extension of Time (2 months) that was received in the Patent Office on October 17, 2000.

Applicant has rewritten all claims to define the invention more particularly and distinctly so as to overcome the technical rejections and define the invention patentably over the prior art.

Claims objections: Applicant has made the appropriate correction, in Claim 2, line 1, to change "enclosure for" to "assembly of".

Applicant changed also the wording of Claim 1, in order to use the better term "assembly of".

Summary of Claims Rejection

Claims 1 and 2 were rejected under U.S.C. 103(a) as being unpatentable over Yang (US 5,615,023) in view of King (US 5,971,468).

Response Regarding Claim 1

1. Inoperative Reference: In regard to King, the applicant respectfully submits that this reference is ineffective, because the applicant has an earlier effective filing date, due to his Provisional Patent Application 60/071/830, filed January 20, 1998.

2. Unsuggested Combination: The prior-art references (King and Yang) do not contain any suggestion (express or implied) that they be combined, or that they be combined in the manner suggested.

3. Solved Different Problem: Applicant's invention solves a different problem than the reference (King), and such different problem is recited in the claims. In re Wright, 6 USPQ 2d 1959 (1988).

Applicant's sunvisor-mounted display is a video display capable of showing moving pictures of the scene outside and behind the trailer.

The King display provides information that is ordinarily found on the instrument panel of the vehicle, in the various gauges, showing the operating condition of the vehicle.

4. New Principle of Operation: The invention utilizes a new principle of operation. Applicant has blazed a new trail, rather than followed one.

Yang claims a display comprising a hologram optical system and a holographic combiner.

Applicant's display has nothing whatsoever to do with the principle of a hologram. Applicant's display is based on

the principle of the camcorder-type liquid crystal display monitor, that is small and thin and capable of being mounted on a sunvisor.

5. Made Simpler: A prior-art version has been made simpler without loss of capability.

Applicant's display, using a camcorder-type LCD monitor, is much more simple, and presumably much more cost effective, than the complex holographic display of Yang.

Applicant's sunvisor-mounted display is a novel improvement over the complex holographic display of Yang; and the advantages are stated in applicant's claim:

"...whereby said sunvisor, when lowered, allows a driver easy, direct, close-range, sunlight-protected viewing of said monitor screen, as if the screen were a rear-view mirror, when used in conjunction with a video camera, to see to the rear when the unaided view is obstructed."

6. Lack of Implementation: If applicant's sunvisor-mounted video display were in fact obvious, because of its advantages noted above, those skilled in the art surely would have implemented it by now. That is -- the fact that those skilled in the art have not implemented the invention, despite its great advantages, indicates that it is not obvious.

Therefore, applicant submits that Claim 1 is allowable over cited references and solicits reconsideration and allowance in its rewritten form as Claim 3.

Response Regarding Claim 2

1. Background To The Legal Arguments Which Will Follow:

The main attribute of the applicant's plate-mounted assembly (micro-video, pin-holed lens camera) is that it is hidden from view, and this lessens the risk of vandalism.

The claim as originally stated: "... whereby said mounted enclosure conceals the pin-hole camera to lessen the risk of vandalism..." The claim as amended now states: "... whereby said plate-mounted assembly conceals said pin-holed lens camera to lessen the risk of vandalism..."

The assembly needs to be placed behind something that is thin and inconspicuous, for example, a license plate, with a tiny hole drilled through it, so that the pin-holed lens of the micro-video camera can see through.

The plate must be thin so that the field of view of the lens is not substantially reduced in size. A wide-angle field of view is advantageous while backing.

Affixing the back of the metal plate directly against the metal lens housing creates a problem: In winter conditions the coldness of the metal plate passes to the metal lens housing and then to the interior circuit board, causing the camera to become inoperative. In summer conditions, excessive heat passes through to the interior of the camera.

Therefore, the clear plastic pane in the applicant's assembly insulates, and also protects from moisture, dust, and scratches.

The plastic pane is necessary in order for the assembly to be mounted on the back side of the plate in a manner that is effective in all weather conditions.

But the main reason for the plate-mounted assembly is to hide the camera from view to lessen the risk of vandalism, yet to allow the camera to be positioned low enough to have a direct view of a loading platform, or dock.

A video camera assembly positioned low, at the back of a freight trailer, and not hidden from view, is exotic and will attract attention.

In Houston, Texas, for example, many freight trailers are parked in lots next to the Houston Ship Channel. This is an industrial section of the city. Street gangs of youth are common in this area.

Those conditions are certainly not limited to Houston, Texas. Gangs are common in urban, industrial sections. Tractor/trailer rigs naturally gravitate to industrial sections.

A video camera assembly positioned low but not hidden from view is at risk of being vandalized -- damaged or stolen.

The applicant's plate-mounted assembly is a novel improvement over an assembly that is positioned low but not hidden from view.

2. Unrecognized Problem: The problem solved by the invention

was never before even recognized. The recognition of an unrecognized problem militates in favor of patentability.

Yang does not address the risk of vandalism at all.

3. Lack of Implementation: If applicant's plate-mounted assembly were in fact obvious, because of its advantages, those skilled in the art surely would have implemented it by now. That is -- the fact that those skilled in the art have not implemented the applicant's plate-mounted assembly, despite its great advantage, indicates that it is not obvious.

4. As stated earlier in this Response, the plastic pane is is necessary in order for the assembly to be mounted on the back side of the plate in a manner that is effective in all weather conditions. But it is the plate-mount itself that is the heart of the invention (Claim 2). Therefore, the applicant decided to delete mention of the pane in the amended claim (Claim 4).

Therefore, for the reasons stated above, applicant submits that Claim 2 is allowable over the cited reference and solicits reconsideration and allowance in its amended form, as Claim 4.

Conclusion

For all of the above reasons, applicant submits that the claims are now in proper form, and that the claims all define patentably over the prior art. Therefore, he submits that this application is now in condition for allowance, which action he respectfully solicits.

Conditional Request For Constructive Assistance

Applicant has amended the claims of this application so that they are proper, definite, and define novel structure which is also unobvious. If, for any reason this application is not believed to be in full condition for allowance, applicant respectfully requests the constructive assistance and suggestions of the Examiner pursuant to M.P.E.P.706.03(d) and 707.07(j) in order that the undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Very respectfully,

Rolf Jansen

Rolf Jansen, Applicant Pro Se
P.O. Box 73161
Houston, TX 77273-3161
Tel. 281-440-6907

Certificate of Mailing: I certify that on the date below this document and referenced attachments, if any, will be deposited with the U.S. Postal Service as first class mail in an envelope addressed to: "BOX NON-FEE AMENDMENTS, ASSISTANT COMMISSIONER FOR PATENTS, WASHINGTON, DC 20231."

January 2, 2001 Rolf Jansen

Rolf Jansen, Applicant

(6)

In the United States Patent and Trademark Office

Mailed 1999, Jan. 15

Box Patent Application
Assistant Commissioner for Patents
Washington, District of Columbia 20231

Sir:

Please file the following enclosed patent application papers:

Applicant #1, Name: Rolf Jansen

Applicant #2, Name: _____

Title: Tractor/Trailer Back-up Kit

☒ Specification, Claims, and Abstract: Nr. of Sheets 39

☒ Declaration: Date Signed: JAN. 15, 1999

☒ Drawing(s): Nr. of Sheets Enc.: Formal: 5 Informal: _____

☒ Small Entity Declaration of Inventor(s) ☒ SED of Non-Inventor / Assignee / Licensee

☐ Assignment enclosed with cover sheet and recordal fee; please record and return.

☒ Check for $ 395.00 for:

☒ $ 395.00 for filing fee (not more than three independent claims and twenty total claims are presented).

☐ $ _____ additional if Assignment is enclosed for recordal.

☐ Disclosure Document Program reference letter.

☒ Pursuant to 35 U.S.C. §119(e)(i), applicant(s) claim priority of Provisional Patent Application Ser. Nr. 60/071,830, filed 1/20/98.

☒ Return Receipt Postcard Addressed to Applicant #1.

☒ **Request Under MPEP § 707.07(j):** The undersigned, a pro se applicant, respectfully requests that if the Examiner finds patentable subject matter disclosed in this application, but feels that Applicant's present claims are not entirely suitable, the Examiner draft one or more allowable claims for applicant.

Very respectfully,

Rolf Jansen
Applicant #1 Signature

Applicant #2 Signature

P. O. Box 73161
Address (Send Correspondence Here)

Houston, TX 77273

Address

Express Mail Label # EJ575750995US **; Date of Deposit 1999**, JAN. 15

I hereby certify that this paper or fee is being deposited with the United States Postal Service using "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to "Box Patent Application, Assistant Commissioner for Patents, Washington, DC 20231."

Signed: Rolf Jansen
Inventor

Form 10-1: Patent Application Transmittal Letter

PTO-103X
(Rev. 8-95)

FILING RECEIPT

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OF PATENTS AND TRADEMARKS
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APPLICATION NUMBER	FILING DATE	GRP ART UNIT	FIL FEE REC'D	ATTORNEY DOCKET NO.	DRWGS	TOT CL	IND CL
09/232,566	01/15/99	3632	$380.00		5	2	2

ROLF JANSEN
P O BOX 73161
HOUSTON TX 77273

Receipt is acknowledged of this nonprovisional Patent Application. It will be considered in its order and you will be notified as to the results of the examination. Be sure to provide the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please write to the Application Processing Division's Customer Correction Branch within 10 days of receipt. Please provide a copy of the Filing Receipt with the changes noted thereon.

Applicant(s)

ROLF JANSEN, HOUSTON, TX.

CONTINUING DATA AS CLAIMED BY APPLICANT-
PROVISIONAL APPLICATION NO. 60/071,830 01/20/98

FOREIGN FILING LICENSE GRANTED 02/03/99 * SMALL ENTITY *
TITLE
TRACTOR/TRAILER BACK UP KIT

PRELIMINARY CLASS: 248

DATA ENTRY BY: RORIE, DEANNA TEAM: 03 DATE: 02/04/99

(see reverse)

US005940120A

United States Patent [19]

Frankhouse et al.

[11] Patent Number: 5,940,120

[45] Date of Patent: Aug. 17, 1999

[54] VANITY CONSOLE

[75] Inventors: Jay M. Frankhouse; Ryan S. Anair; Michael B. Vanden Elzen, all of Holland; Russell L. Clark, West Olive, all of Mich.

[73] Assignee: Prince Corporation, Holland, Mich.

[21] Appl. No.: 08/545,947

[22] Filed: Oct. 20, 1995

[51] Int. Cl.[6] H04N 7/18

[52] U.S. Cl. 348/61; 348/148

[58] Field of Search 348/44, 61, 143, 348/794, 115, 148; 33/356; 362/83.1, 144, 2, 30; 606/11; 340/475, 148; 396/2; 345/7, 9; 296/37.7; 29/863; 356/141.1

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5,741,966	4/1998	Handfield	73/146.5

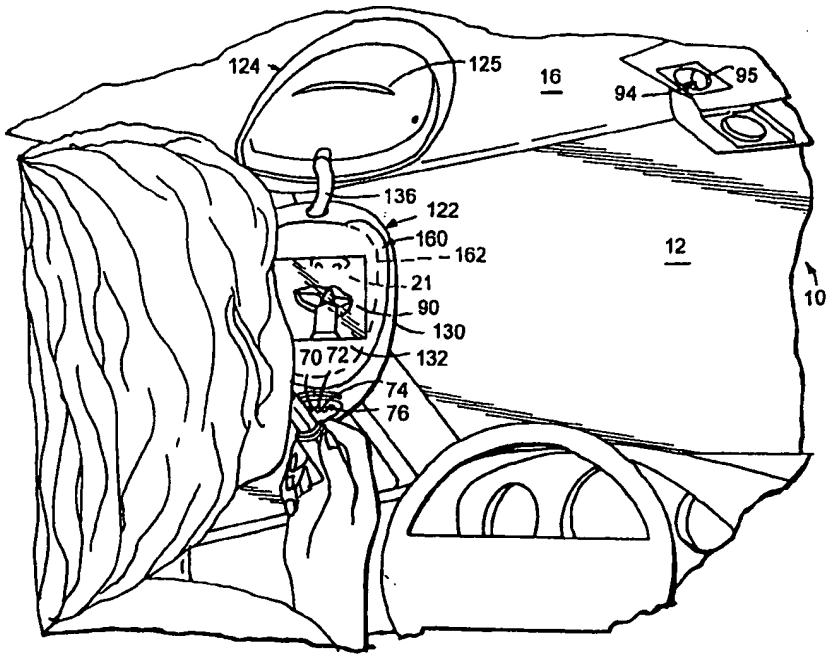
Primary Examiner—Bryan Tung

Attorney, Agent, or Firm—Price, Heneveld, Cooper, DeWitt & Litton

[57] ABSTRACT

A vanity console is provided with a housing having a mirror mounted therein made of a material providing both reflectivity and transmissivity characteristics. A source of illumination such as a peripheral fluorescent tube extends behind the outer periphery of the mirror and directs light through the two-way mirror for use of the vanity mirror in low ambient light conditions. The mirror preferably is shaped to conform to the shape of a user's face. In one embodiment of the invention, positioned centrally behind the mirror is a video image source, such as an LCD display, which is supplied with video information from a variety of sources such as vehicle mounted cameras that the vanity console can serve the function of video imaging as well.

12 Claims, 7 Drawing Sheets



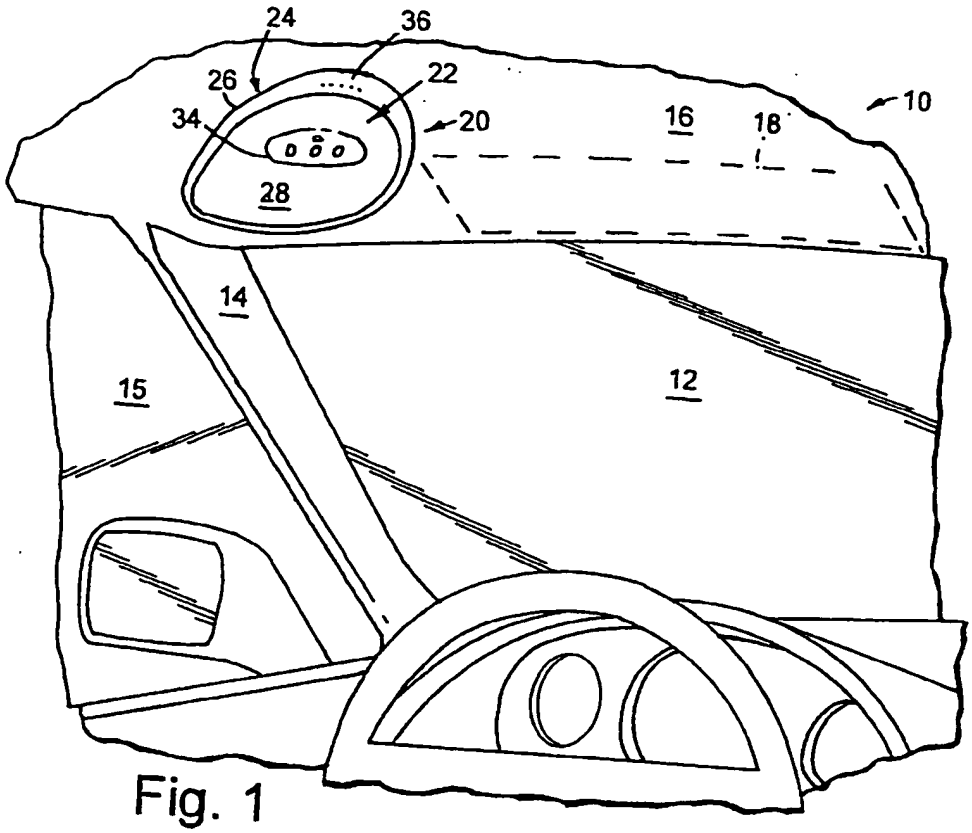

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Fig. 1

Fig. 2

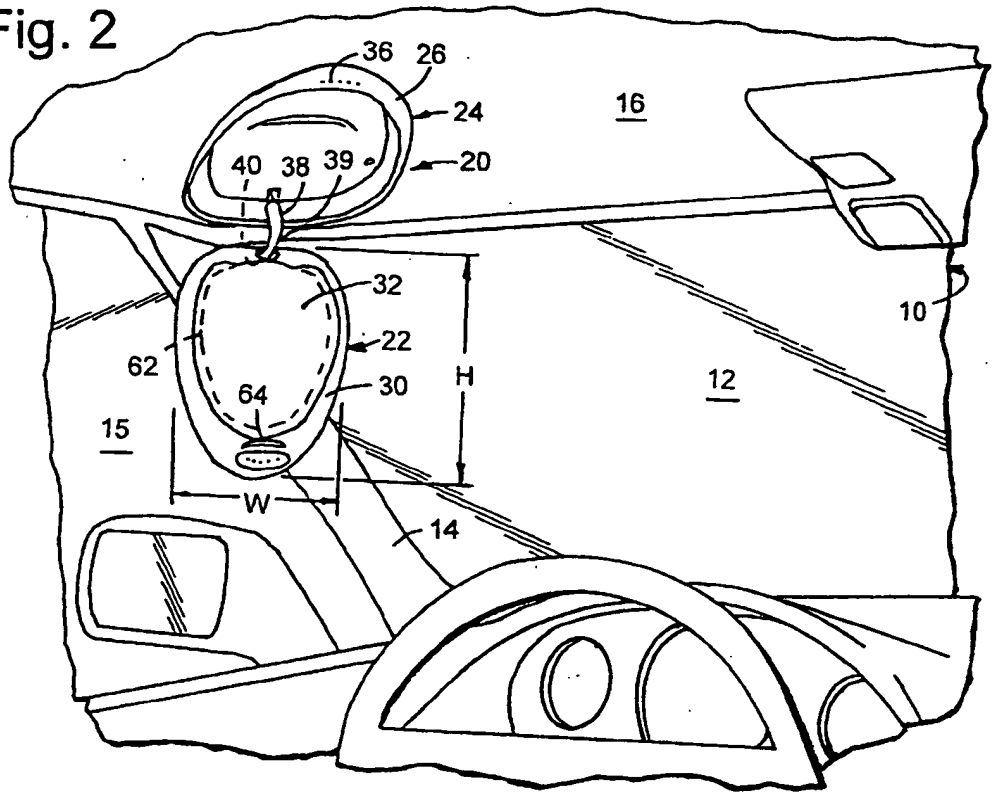
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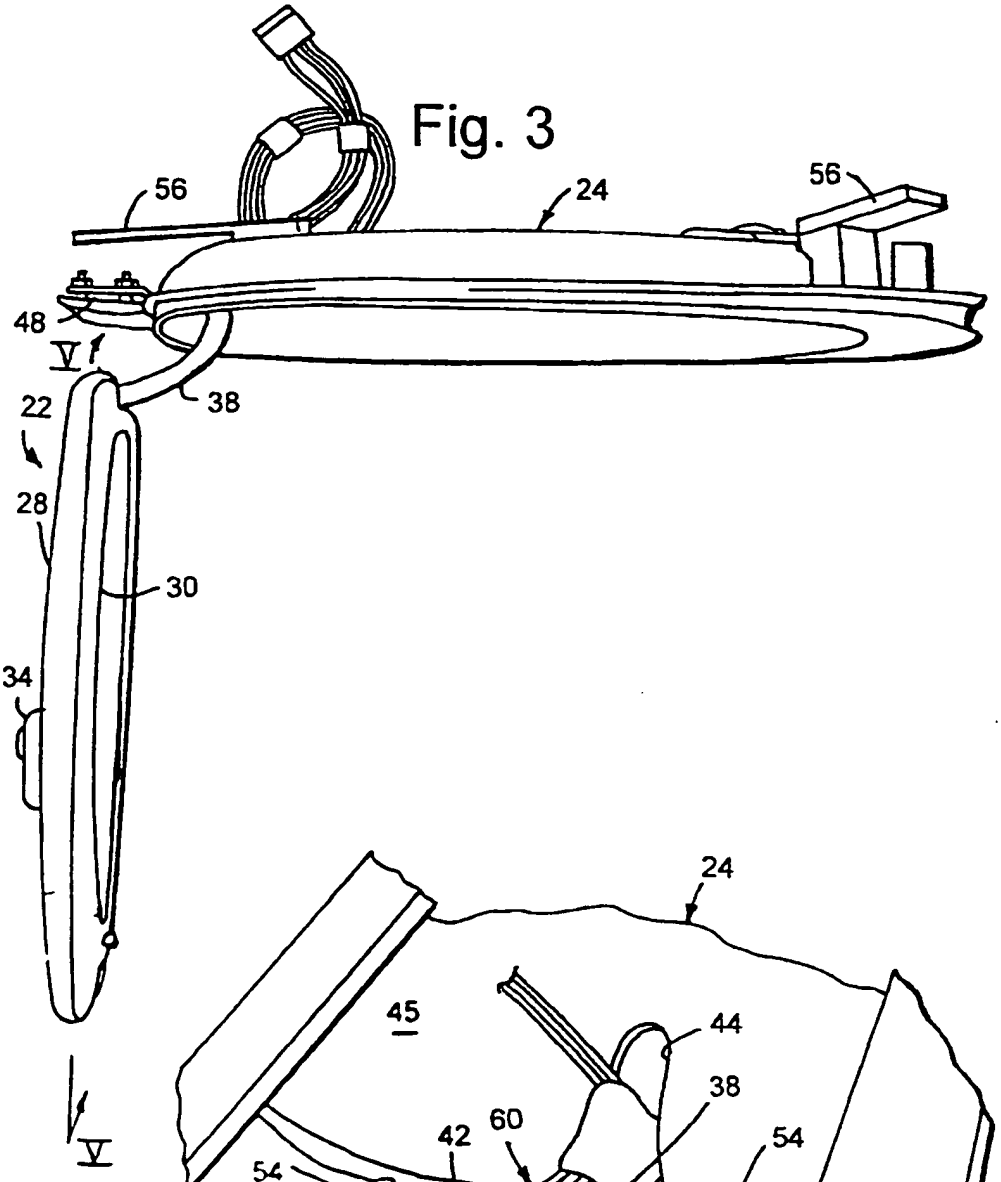
Fig. 3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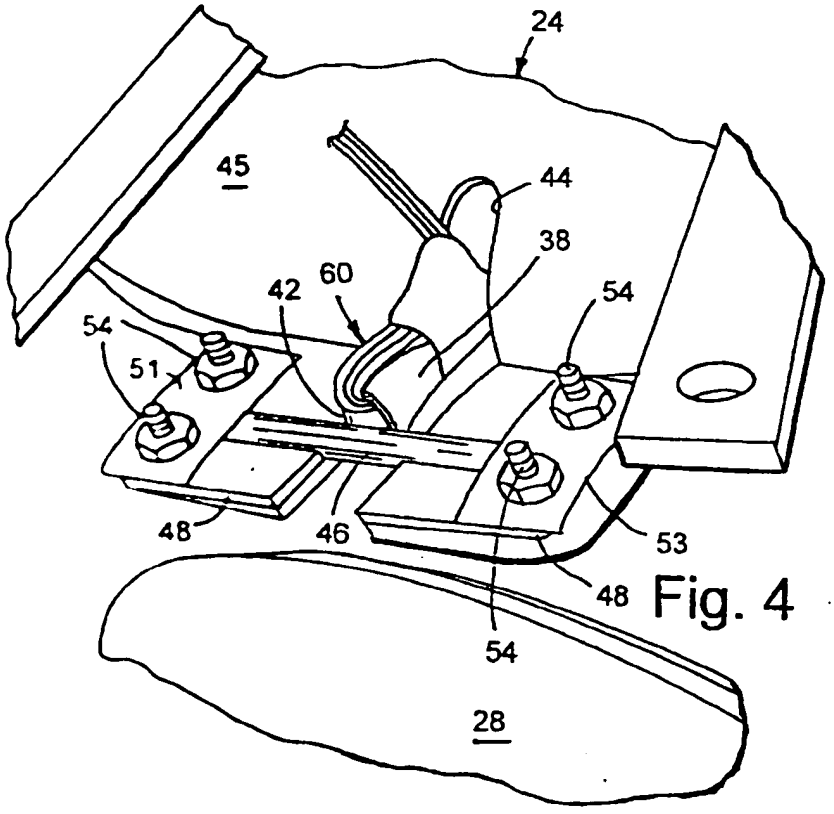
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Fig. 4

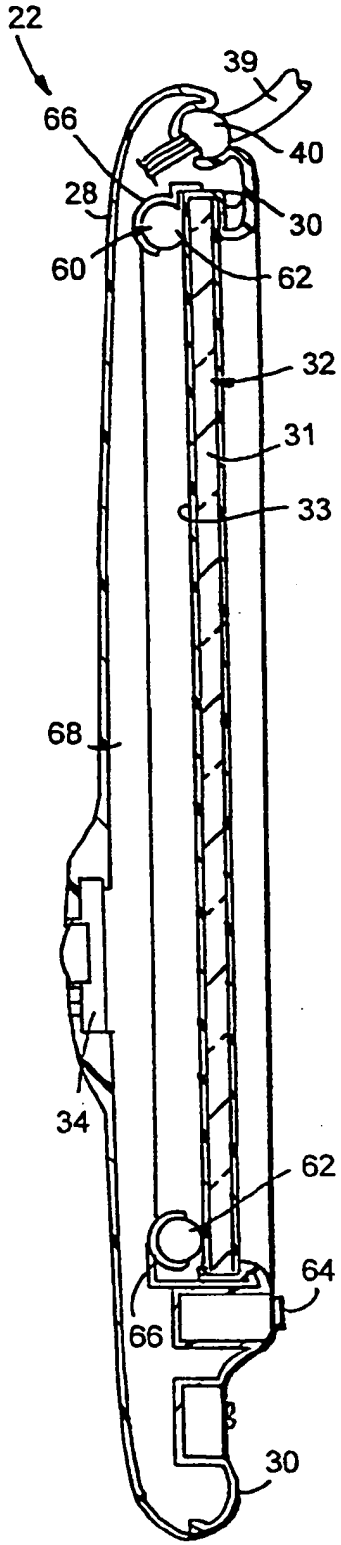
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Fig. 5

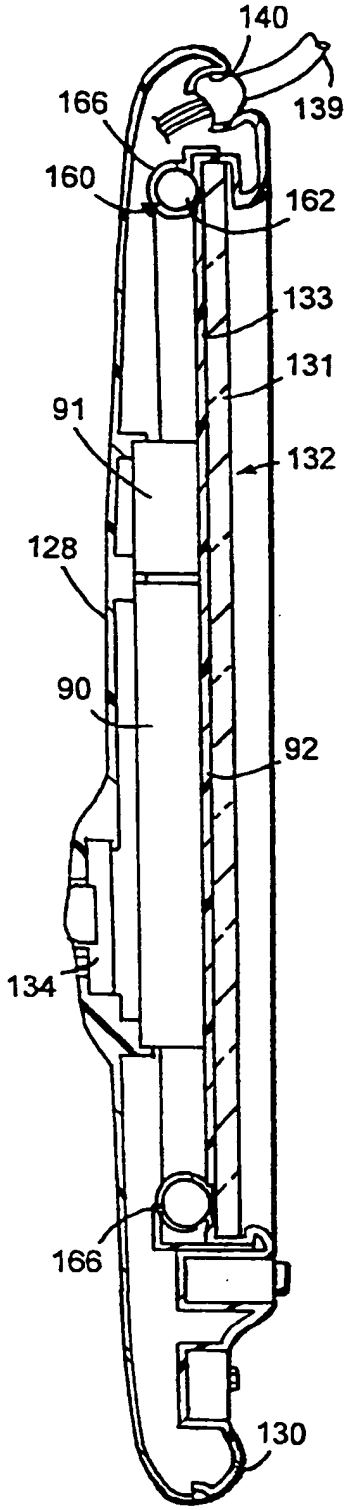
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Fig. 8

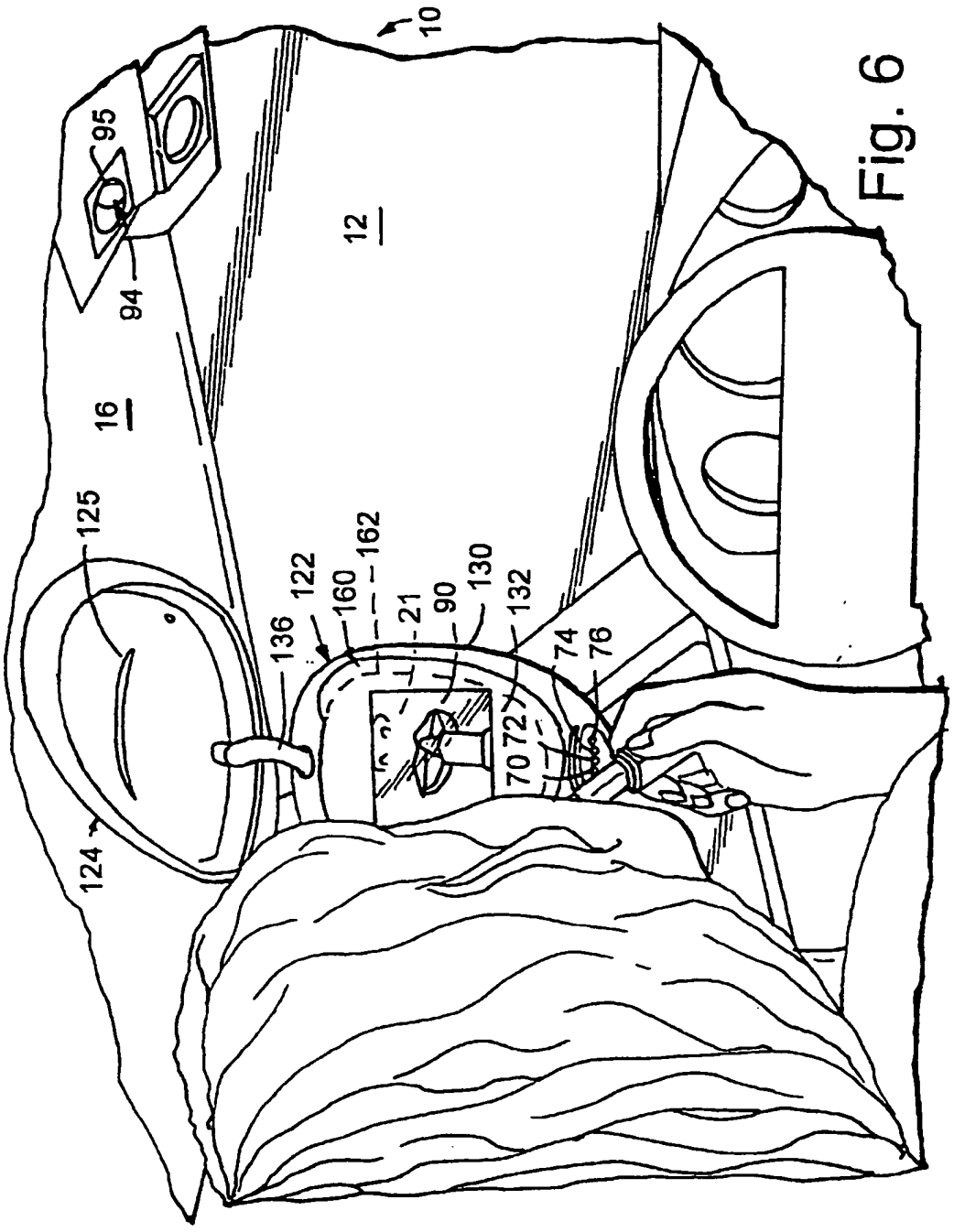
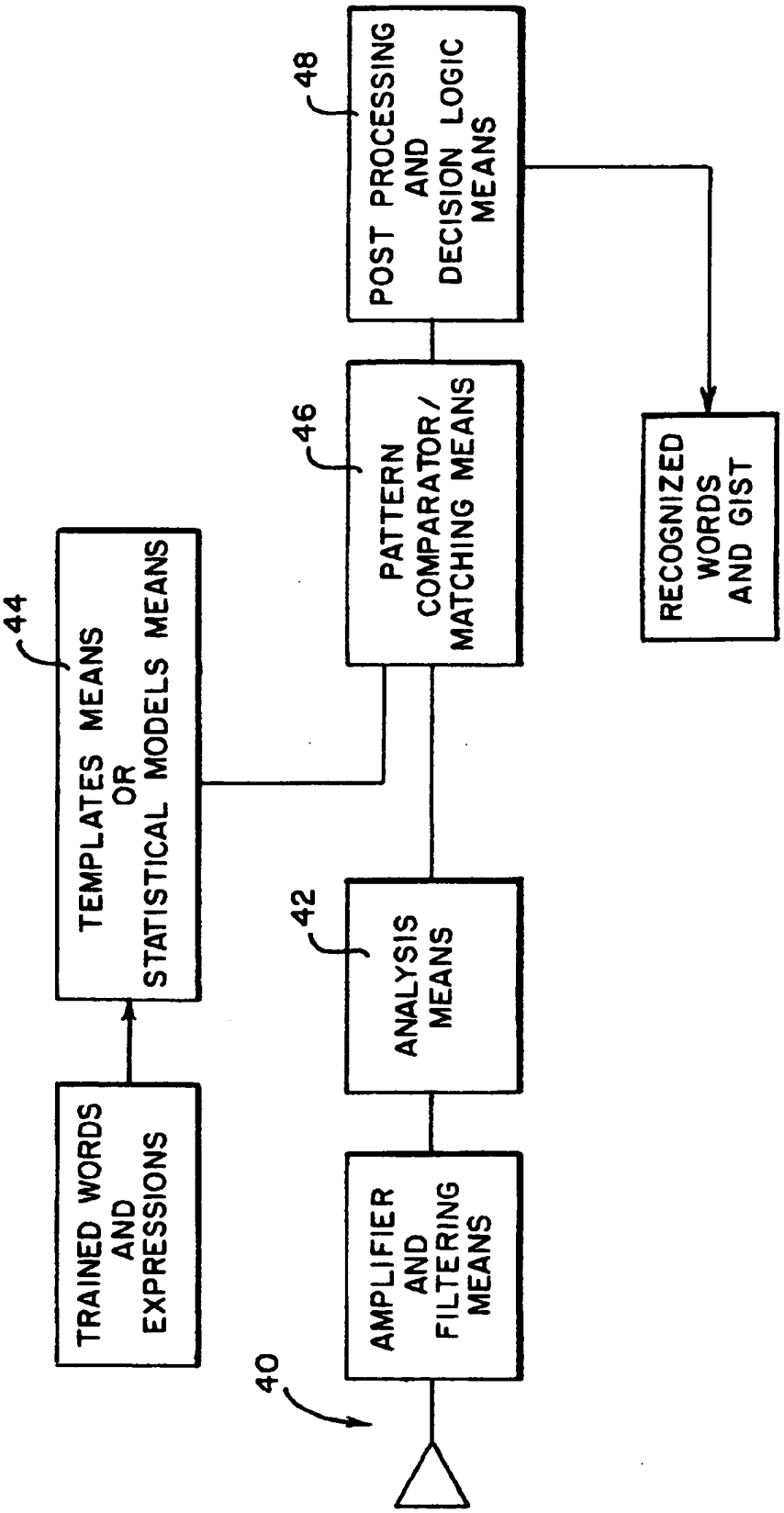


Fig. 6

FIG. 4


40
AMPLIFIER AND FILTERING MEANS
42
ANALYSIS MEANS
44
TEMPLATES MEANS OR STATISTICAL MODELS MEANS
46
PATTERN COMPARATOR/ MATCHING MEANS
48
POST PROCESSING AND DECISION LOGIC MEANS
TRAINED WORDS AND EXPRESSIONS
RECOGNIZED WORDS AND GIST

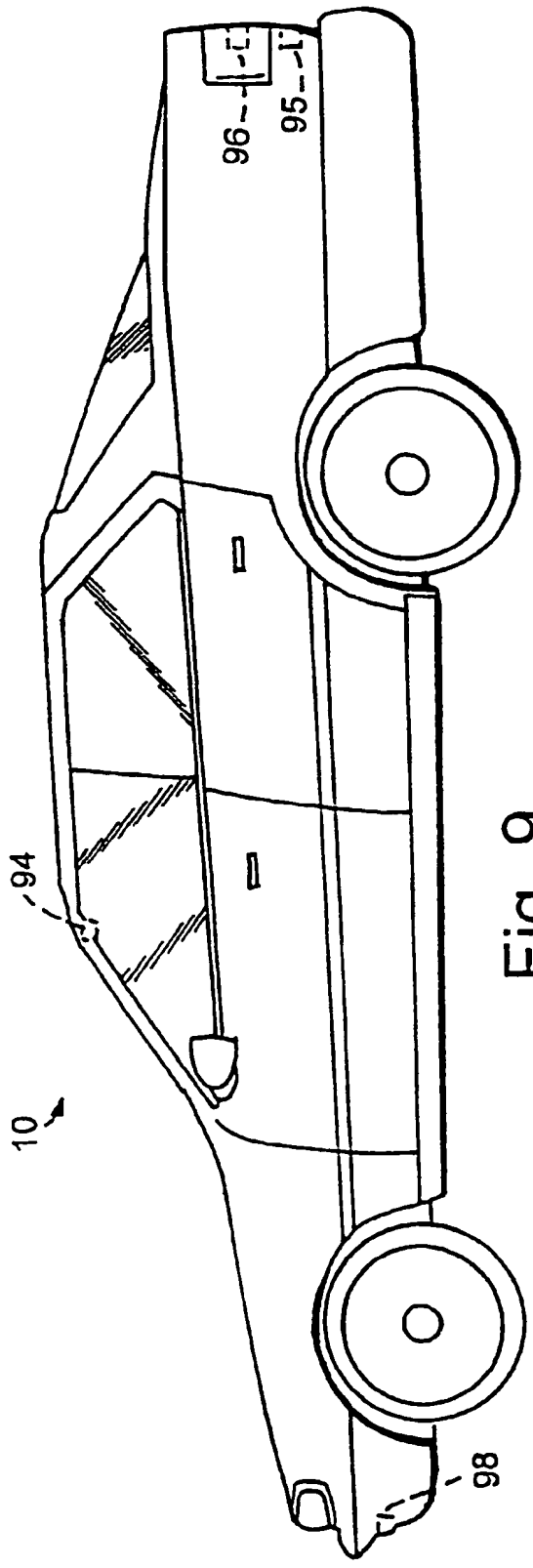


Fig. 9

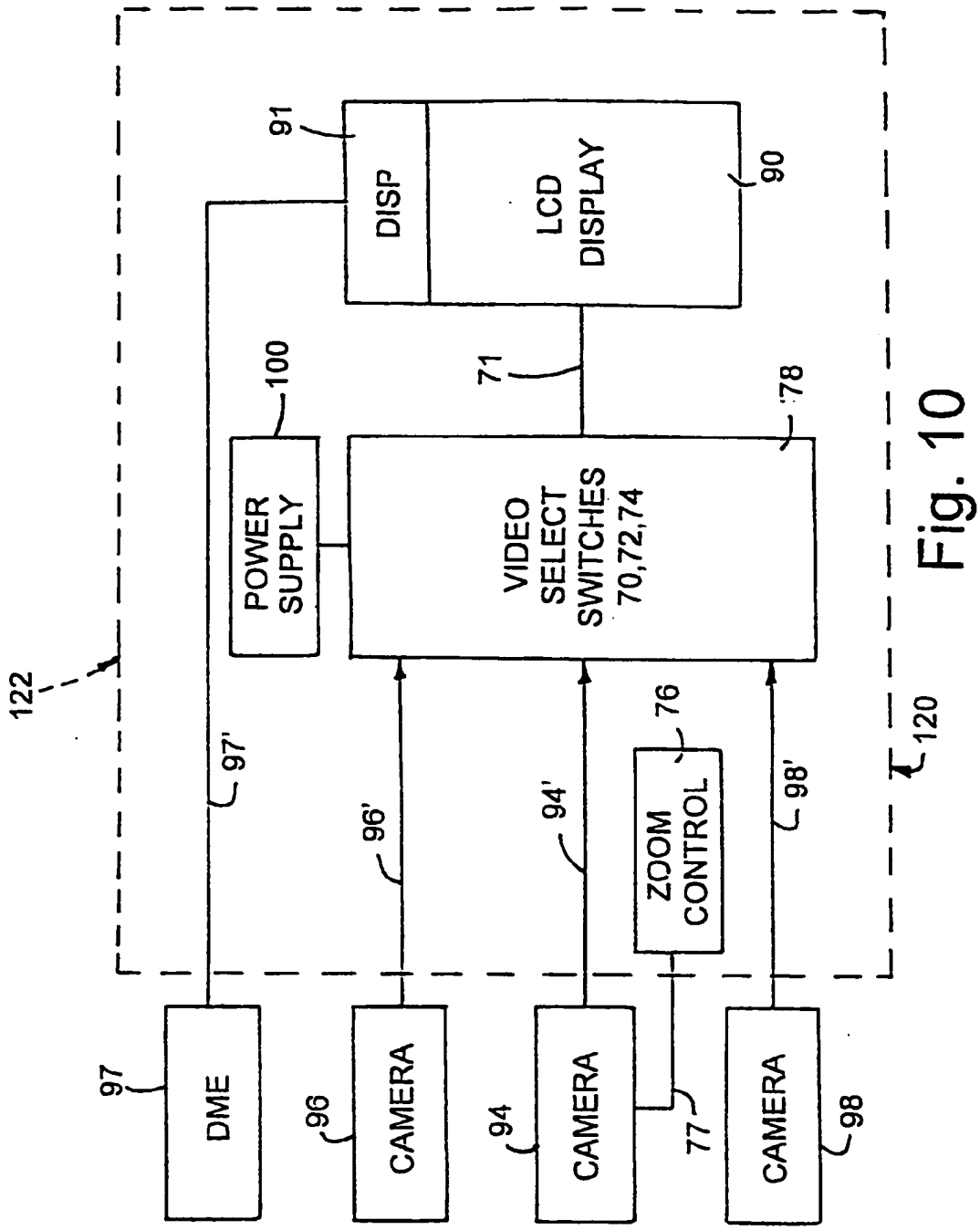

122
120
91
DISP
LCD DISPLAY
90
71
100
78
POWER SUPPLY
VIDEO SELECT SWITCHES 70,72,74
76
ZOOM CONTROL
97'
96'
94'
98'
97
DME
96
CAMERA
94
CAMERA
77
98
CAMERA

Fig. 10

VANITY CONSOLE

BACKGROUND OF THE INVENTION

The present invention relates to a vanity console for use in a vehicle and one which provides an illuminated vanity mirror and/or video imaging.

Illuminated vanity mirror visors have been popular for many years and are a commonplace vehicle accessory. Although the vanity mirror incorporated in a visor is a convenient and cost efficient utilization of the visor for multiple functions, it does not always provide optimized functionality for a vanity mirror which is due, in part, to the shape constraints on a mirror mounted to a visor. U.S. Pat. Nos. 4,824,159 and 5,182,675 disclose vehicle mounted vanity mirrors which are shaped to conform more closely to the face of a user and which are mounted independently from a visor. Such mirrors function only as vanity mirrors and, when illuminated, the mirror area available, due to the placing of lights on either side of the mirror, is somewhat limited.

There remains a need to provide separate functions for visors and for illuminated **15** vanity mirrors which optimize the functionality of the viewing structure. It is desirable, therefore, to provide a mirror which is proportionate to the shape of one's face and provide improved lighting. Further, it is desirable to provide a vanity console which can be located in an area which does not interfere with the operation of separate visors nor block the operator's or driver's view of the roadway.

SUMMARY OF THE PRESENT INVENTION

By providing a vanity console which can be optimally located in the vehicle headliner at one or more locations, each individual can be provided with an illuminated vanity mirror which is positioned conveniently for utilization as a vanity mirror without interfering with the operation of other vehicle accessories, such as overhead consoles, visors, or the like. In the preferred embodiment of the invention, a vanity console is provided with a housing having a mirror mounted therein made of a material providing both reflectivity and transmissivity characteristics. The vanity console is coupled to a storage housing by a mechanical linkage allowing the console housing to be moved from a recessed, stored position within, in the preferred embodiment, the headliner of a vehicle to various lowered, adjustable use positions.

In the preferred embodiment of the invention, the illumination means comprise a peripheral fluorescent tube extending around and behind the outer periphery of the mirror for directing light through the optical coating for use of the vanity mirror in low ambient light conditions. The mirror preferably is shaped to conform to the shape of a user's face. When the mirror is used without illumination, the entire surface area of the mirror is available for use and, when the illumination is activated, only a relatively small peripheral boarder directs illumination toward the user's face thereby optimizing the surface area of the mirror usable under both low and high ambient light conditions.

In another embodiment of the invention, positioned centrally behind the mirror is a video image source, such as an LCD display, which is supplied with video information from a variety of sources such as vehicle mounted cameras such that the vanity console can serve the additional function of video imaging. In some embodiments of the invention, the video imaging is enhanced vision providing, for example, magnification of a portion of the user's face. Alternatively, the system may include cameras directed forwardly and/or

rearwardly of the vehicle for providing rear visibility for parking, internal rear visibility for conversation with rear seat passengers or forward visibility utilizing an enhanced light amplification camera for providing video images under low ambient light conditions.

Thus, the vanity console of the present invention provides both an improved vanity mirror for utilization by a vehicle operator or passenger and/or video imaging for various functions when connected to a source of video signals. These and other features, objects and advantages of the present invention will become apparent upon reading the following description thereof together with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a fragmentary, perspective view of a vehicle including a vanity console embodying the present invention with the console shown in a stored position;

FIG. **2** is a fragmentary, perspective view of the console of FIG. **1** shown in a lowered use position with behind-the-mirror peripheral illumination;

FIG. **3** is an enlarged left side, elevational view of the vanity console shown in FIG. **2**;

FIG. **4** is an enlarged, fragmentary, top rear perspective view, partly broken away, of the mechanical coupling of the vanity console housing to the storage housing shown also in FIGS. **1–3**;

FIG. **5** is a cross-sectional view of the vanity console taken along section lines V—V of FIG. **3**;

FIG. **6** is a fragmentary, perspective view of a vehicle showing an alternative embodiment of the invention;

FIG. **7** is a fragmentary, perspective view of a vehicle including yet another embodiment of the invention;

FIG. **8** is a vertical, cross-sectional view through the vanity console shown in FIGS. **6** and **7**, showing the mounting of the video displays behind the partially reflective mirror of the vanity console;

FIG. **9** is a pictorial view of a vehicle showing the position of mounting of various cameras in a video imaging system such as that shown in FIGS. **6–8**; and

FIG. **10** is an electrical circuit diagram in block form showing the electrical circuit employed for coupling the circuit elements employed in the video imaging system of the vanity console of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring initially to FIGS. **1** and **2**, there is shown a vanity console **20** embodying the present invention mounted in a vehicle **10**, such as an automobile, and in particular to the roof area above windshield **12** near the junction of the A-pillar **14** with the windshield and roof. The vanity console **20** is, in the preferred embodiment, recessed within the headliner **16** and is positioned in the embodiment shown in FIG. **1** in the upper left front corner of the driver's side of the vehicle. The vehicle may include a slide out visor assembly **18** of the type disclosed in U.S. Pat. No. 5,328,277, although a conventional visor assembly can be employed with its pivot rod bracket positioned below console **20**.

Console **20** comprises a vanity mirror housing **22** movably coupled to a recessed storage housing **24** which may include a decorative bezel **26**. Housing **22** comprises an outer panel **28** forming the outer decorative covering for the

housing 22 and an inner frame 30 (FIGS. 2 and 3) for a vanity mirror 32 mounted, as best seen in FIG. 5, between panel 28 and frame 30. Recessed within the surface of panel 28 may be a trainable garage door opening transmitter 34 (FIGS. 1 and 5) of the type disclosed in U.S. Pat. No. 5,442,340. The vanity console 20 provides a convenient location for operation of such a garage door opening transmitter which can also be employed for the activation of interior home lighting utilizing one of the three available channels. A latch assembly with an actuator pad 36 on the bezel 26 holds the movable console housing 22 within storage housing 24. When actuator pad 36 is depressed by the operator, the latch, which can be of conventional design, allows the vanity console which is coupled to storage housing 24 by a mechanical linkage, shown in FIGS. 3 and 4 and described below, to drop down sufficiently to allow the user to move the console downwardly into a selected use position as shown, for example, in FIG. 2 in which the mirror 32 is exposed for use.

As best seen in FIG. 2, vanity housing 22 is somewhat oval and generally tear-dropped or face shaped such that mirror 32 can approximate the proportions of the face of a user. Thus, the height "H" of the housing 22, as seen in FIG. 2, is sufficiently greater than its width "W." In one embodiment, the height "H" of housing 22 was approximately 7 inches while the width "W" was approximately 5.75 inches. Although the vanity console 20 as shown in FIGS. 1 and 2 is mounted to the upper left front corner of the vehicle, a similar console can be mounted in other locations, such as the right front corner for the passenger, the center of the vehicle if it does not include an overhead console with, for example, a compass, or in individual rear seating areas by mounting such consoles to the vehicle roof in appropriate alignment with rear seats of the vehicle. Thus, a vehicle may contain a plurality of such vanity consoles for providing personalized viewing for each occupant. The details of construction of the illuminated vanity console 20 are now presented in conjunction with FIGS. 1–5.

The console housing 22 is pivotally mounted to the storage housing 24 by means of a mechanical linkage comprising, in the preferred embodiment as seen in FIGS. 2–5, a curved arm 38 having a lower end 39 coupled to housing 22 by a ball joint assembly 40 (FIG. 5) of conventional construction to allow the housing 22 to be adjustably pivoted about end 39 of arm 38. The opposite end 42 (FIG. 4) of arm 38 extends through a slot 44 in the rear wall 45 of storage housing 24, as best seen in FIG. 4, and is coupled to a transversely extending pivot rod 46 which is mounted to a split flange 48 extending from the periphery of housing 24. In the preferred embodiment, flange 48 is bifurcated and includes semicylindrical sockets 50, 52 for receiving the pivot rod 46 which is captively held to the bifurcated flange 48 by means of keeper plates 51, 53 secured to flange 48 by suitable fasteners such as nut and bolt combinations 54. The hollow pivot arm 38 allows a plurality of electrical conductors 60 to extend from within the console housing 22 to the vehicle's electrical system for providing operating power and video signals for the video imaging system of the present invention.

Housing 24 is mounted to the sheet metal roof of a vehicle using suitable mounting brackets 56 which extend outwardly from the periphery of the housing 24, as illustrated in FIG. 3, at various locations to secure the housing either directly to the sheet metal roof of the vehicle or to a reinforced area of the headliner 16 if console 20 is pre-mounted to the headliner as a preformed assembly.

The mirror 32 of the preferred embodiment is, as best seen in FIG. 5, a two-way type mirror which includes an outer glass surface 31 to which there is applied a partially reflective and partially transmissive coating 33 to provide partial reflectivity and partial transmissivity for mirror 32. In the preferred embodiment of the invention, coating 33, which is a standard commercially available film which can be vacuum deposited onto the rear surface of glass panel 31, had a reflectivity of from 50 to 90 percent and a transmissivity of from 50 to 10 percent, respectively. The reflectivity, in the preferred embodiment, was about 60 percent, while the light transmissivity was about 40 percent. The purpose of employing the two-way mirror 32 for the vanity console is to allow illumination means 60 positioned behind the mirror 32 and/or a video monitor, as described in another embodiment below, to be viewable and visible from the front side of the mirror only when actuated. The mirror 32 appears as a standard mirror when such illumination means 60 are not activated.

In a preferred embodiment of the invention as seen in FIGS. 2 and 5, illumination means 60 comprises a peripheral fluorescent tube 62 with a generally circular cross section extending around the periphery of mirror 32 to provide even illumination for the face of the user. When actuated by light switch 64 (FIG. 2), the fluorescent tube 62 provides light through the transmissive film 33 to the face of the user for illuminating the face of the user with the central area of the mirror still appearing as a mirror to the user. Fluorescent tube 62 can be any glass tube filled with a suitable fluorescent gas mixture such as mercury-argon to provide the desired light frequency for utilization as a vanity mirror light. Tube 62 is mounted to the frame 30 utilizing suitable mounting brackets such as brackets 66 (FIG. 5) spaced at suitable locations and secured to the inner surface of the periphery of frame 30 to provide the secure mounting of the light tube 62. In FIG. 2 tube 62 is shown in phantom to illustrate that it is substantially invisible behind mirror 32 except when illuminated.

The power supply for actuating the fluorescent tube 62 can also be suitably mounted within the central open area 68 of console housing 22 and is coupled to the vehicle's 12-volt electrical system through the actuating switch 64 which is coupled to the vehicle's operating system through a suitable power conductor included in the bundle of electrical conductors 60. The mirror 32 is commercially available from a variety of commercial suppliers, such as Libbey Owens Ford, and can be manufactured with the desired light transmissive/ reflective characteristics for a given installation. Similarly, illumination means 60, although in the preferred embodiment comprises a fluorescent tube, may take on other forms of illumination such as conventional lamps. It has been discovered, however, that the peripheral boundary lighting provided by the continuous fluorescent tube 62 is preferable.

In addition to providing the illuminated vanity mirror with concealed illumination to allow the full surface of the mirror to be used under normal ambient lighting and an illuminated mirror to be used under low ambient lighting, the console 20 of the present invention can also provide video imaging as illustrated in the embodiments shown in FIGS. 7–10. In such embodiments, a video monitor is incorporated in the space 68 (FIG. 5) of the illuminated vanity console 22 which provides the same illuminated or non-illuminated vanity mirror functions as before with the addition of the capability of video imaging behind the light transmissive mirror 32 when desired. The video imaging is now described in connection first with the display functions provided in FIGS. 6 and 7 and subsequently the description accompanying FIGS. 8–10.

Referring to FIG. 6, there is shown a vanity console 120 which is of the same construction as vanity console 20 with similarly identified components including the numerical prefix "1." Console 120 additionally includes of video monitor 90, video source selector switches 70, 72, 74 and zoom control switch 76, which switches are mounted to the lower end of housing 130. As seen in FIGS. 6 and 8, positioned centrally behind the mirror 132 is a flat screen video monitor 90 having a video image projecting surface 92 immediately adjacent film 133 such that images projected by monitor 90 can be seen through mirror 132 as seen in FIG. 6. A first television camera 94 has a zoom lens 95 controlled by zoom control switch 76 and is pointed toward the user's face. Camera 94 is activated by switch 70 which also couples its composite video output signals to the input of monitor 90. Camera 94 thus can provide an enhanced close-up and magnified image, shown as the lip area 21 of the user 23 in FIG. 6, such that such a magnified image can be viewed through the vanity console 120. With such system, it may be desirable to actuate the illumination means 160 to provide sufficient light for camera 94 to provide a clear magnified image of a portion of the user's face. Camera 94 can be a conventional color CCD type camera with a controllable zoom lens 95 to also provide a wide angle field of view such that the user can view rear seat passengers either for conversational purposes or for tending to infants or young children. Thus, camera 94 typically will be mounted in an area proximate the user 23 but also facing generally rearwardly such that it can provide a clear line of vision to both the face of the user as well as the rear seat area of the vehicle. Video monitor 90 can be a conventional flat screen color LCD type monitor, preferably having a diagonal screen of approximately 3 to 4 inches and which receives composite N.T.S.C. video signals from one of a plurality of cameras such as camera 94.

In the embodiment shown in FIG. 7, the vanity console 120 includes not only a video monitor 90 but, in addition, a distance display 91 which operates in conjunction with an ultrasonic or infrared distance measuring sensor 97 associated with a rear vision camera 96 (FIG. 9). Camera 96 is mounted in the rear area of the vehicle, preferably in the rear bumper area behind a suitable sealed window for providing protection for the camera from the environment. A video and power supply conductor 96' extends from camera 96 as described in connection with FIG. 10 to provide composite color video signals to the monitor 90 mounted within the body of console housing 122. Camera 96 can provide a wide angle rear view of traffic or objects behind the vehicle.

As seen in FIG. 7, a video image 25 from camera 96 is displayed by monitor 90 showing the proximity of, for example, a lamp post 27 as being 2.5 meters from the rear bumper area as indicated on display 91 positioned above the monitor display surface 92. The distance measuring (D.M.E.) system 97 is a commercially available unit which provides digital signals from a sensor unit representing the distance of an object from the sensor. Such signals are coupled to an LED display 91 for display. Such D.M.E. units are generally commercially available.

In addition to cameras 94 and 96 as shown in FIGS. 6 and 7, as seen in FIG. 9, a vehicle 10, such as an automobile may also include a forward facing camera 98 which can be employed for selectively providing a wide angle view of the roadway. Camera 98 may be coupled, if desired, to a video tape recorder as well as to monitor 90 for providing a record of areas traveled by, for example, a family on vacation. Thus, in addition to providing front visibility, camera 98 can be used as a video signal source for recording scenery. If desired for use under low ambient light conditions, camera 98 can be of the type including image enhancing sensors such as are commercially available from IT&T to provide low light enhanced visibility under poor lighting conditions to provide a visual aid to the vehicle operator under such conditions. It is to be understood, however, that such enhanced light imaging is used as a further assistance to the vehicle operator and not as the primary field of vision for the vehicle operator. Each of the cameras 94, 96 and 98 can be adjustably mounted to the vehicle to allow the vehicle operator to adjust the pointing direction for particular applications. Such adjustable camera mounts are conventional.

Turning now to FIG. 10, there is shown a block electrical circuit diagram of the system in which each of the cameras 94, 96, 98 are coupled by a video select control circuit 78 including switches 70, 72, 74 for providing a video output signal by a conductor 71 to the video input of monitor 90. Input from camera 96 is applied to video select console 78 through video conductor 96'. Similarly, cameras 94, 98 are coupled via conductors 94', 98' to the input of video selector circuit 78 such that any one of the camera's composite video output signals can be selected for display on monitor 90. Similarly, display 91 is coupled to the distance measuring sensor 97 by means of conductors 97' to provide signals applied to display 91. Zoom control switch 76 is a conventional spring loaded two-position switch coupled to camera 94 by means of a pair of conductors 77 to provide zoom in and zoom out control signals for the camera lens 95. In some installations, it may be desirable to also provide cameras 96 and 98 with zoom lenses, in which case the video select switch console 78 may also include conventional circuits for coupling zoom control 76 to the particular camera selected. Suitable operating power from a vehicle's power source 100 is selectively applied to the cameras by the actuation of the selector switches 70, 72, 74. Such power can be applied through conductors 94', 96', 98' if desired to minimize the required wiring. In the embodiment shown in FIGS. 1–5 and 6–10, when the video monitor 90 is not activated by the actuation of one of the switches 70, 72, 74 a first time (a second depression deactivating the camera and also power to display 90), the mirror 132 can be utilized with or without the back lighted illumination means 160 to provide a vanity mirror for normal use. As with the vanity console 20, consoles 120 can be positioned at various locations within the vehicle and may include additional switch circuits so that each monitor can be coupled to a selected camera or other video source.

These and other modifications to the preferred embodiments of the invention described herein can be made by those skilled in the art without departing from the spirit or scope of the invention as defined by the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A vanity mirror console for a vehicle comprising:

a housing;

a partially reflective two-way mirror mounted to said housing;

a video camera mounted to the vehicle for providing a video image; and

a video display mounted in said housing behind said two-way mirror for providing a video image through said mirror to be visible to a user facing said mirror, wherein said camera has a lens positioned to face the user of said vanity mirror console and an electrical circuit coupling video signals from said camera to said video display for providing a video image of the user's face.

2. The vanity console as defined in claim 1 wherein said lens is a zoom lens and said housing includes a control for operating said zoom lens.

3. The console as defined in claim 1 and further including a source of illumination positioned in said housing behind said mirror and visible when actuated for projecting light outwardly through a first portion of said mirror to provide illumination to the face of a user.

4. The console as defined in claim 3 wherein said partially reflective mirror has a reflectivity from about 50% to 90% and a corresponding light transmissivity from about 50% to 10%.

5. The console as defined in claim 4 wherein said reflectivity is preferably about 60% and said transmissivity is about 40%.

6. A vanity mirror console for a vehicle comprising:

a housing mounted in the vehicle;

a partially reflective vanity mirror mounted to said housing;

a video display mounted in said housing behind said mirror for providing a video image through said mirror to be visible to a user; and

a plurality of video cameras for mounting to a vehicle, wherein a first of said cameras has a lens facing the user of said video console and a circuit selectively coupling video signals from said first camera to said video display for providing a video display of the user's face on said video display.

7. The vanity console as defined in claim 6 wherein said lens is a zoom lens and said housing includes a control for operating said zoom lens.

8. The console as defined in claim 6 wherein a second camera is mounted to the vehicle with a lens facing rearwardly to view objects outside and behind the vehicle, and further including a circuit for selectively coupling said first or said second camera to said video display.

9. The console as defined in claim 8 and further including a third camera for mounting to a vehicle in a forward facing direction for viewing the area in front of the vehicle and wherein said circuit selectively couples at least one of said first, second or third cameras to said video display.

10. The console as defined in claim 6 wherein said partially reflective mirror has a reflectivity from about 50% to 90% and a corresponding light transmissivity from about 50% to 10%.

11. The console as defined in claim 10 wherein said reflectivity is preferably about 60% and said transmissivity is about 40%.

12. A vanity mirror console for a vehicle comprising:

a housing;

a partially reflective mirror mounted to said housing;

a source of illumination mounted in said housing behind said mirror and only visible when actuated for directing illumination outwardly from said source through a portion of said partially reflective mirror to provide illumination to the face of a user;

an electrical circuit including a switch for selectively actuating said source of illumination;

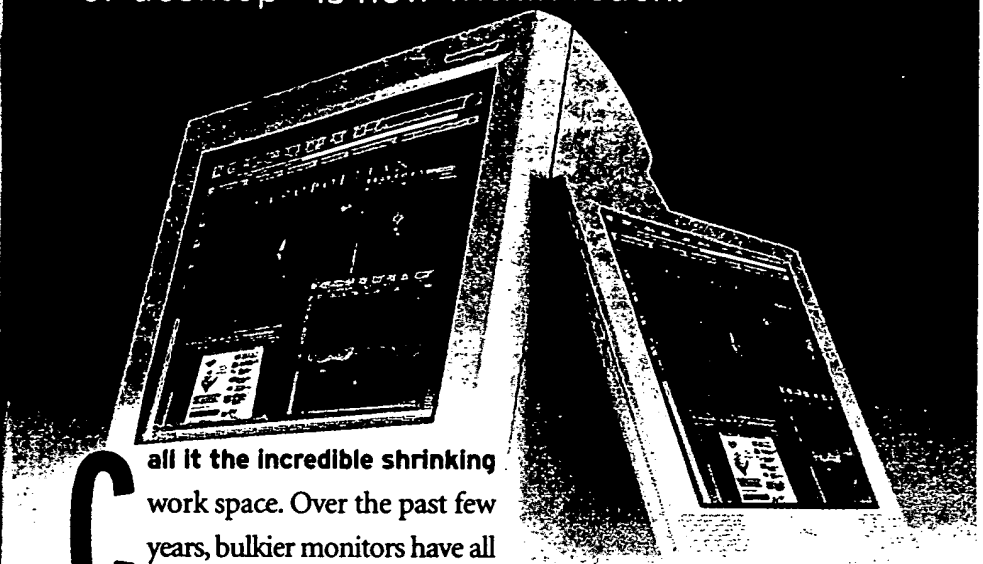
a video display mounted in said housing behind said mirror for providing a video image visible through said mirror when actuated; and

at least one video camera for mounting to a vehicle and a circuit selectively coupling video signals from said at least one camera to said video display for providing video signals for display, wherein said at least one video camera has a lens facing a user of said video console for providing a video display of the user's face.

* * * * *

Space

With lower prices for both larger monitors and flat-panel displays, a roomier screen—or desktop—is now within reach.



Call it the incredible shrinking work space. Over the past few years, bulkier monitors have all but overrun the tops of our desks. Their screens, filled nearly to overflowing with all the icons, web pages, and digital photographs we've crammed onto them, haven't fared much better. Plain and simple, computer users need more real estate—on both their screens and their desks.

A remedy for both shortages exists in the form of a 21-inch flat-panel monitor made from a thin liquid-crystal display (LCD) similar to those used in laptops. But a flat-panel that large comes with a price tag in the thousands. What are realistic options if your budget is in the hundreds?

If a larger screen is a must, a 19-inch cathode ray tube (CRT) monitor may be the answer. Prices have fallen so much in the past couple of years that you can find plenty of these in the $300 to $600 range. If desk space is your priority, a space-saving 15-inch flat-panel can now be had for as little as $600. While costlier than most 19-inch CRTs, that's still 30 percent cheaper than those flat-panels were last year, the result of an increased supply.

To help you choose among the monitors most people buy, we tested five 15-inch flat-panel LCDs, nine 17-inch CRTs (the type that's usually bought with a new computer or as a replacement for an aging monitor), and seven 19-inch CRTs. All 21 models work with an analog computer video card and are compatible with a Windows-based PC or a Macintosh. The exception is the *Apple Studio Display*, which is strictly for PowerPC G4-based Macs. Four very good CRTs tested for last June's report are still available, and they are noted in the Ratings.

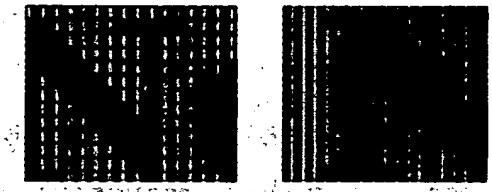
SIZING THEM UP

The CRT size displayed in an ad is generally not the size of the image you see, but the nominal size of the entire tube, including the part that's not visible. Advertisers quote the nominal size, which makes monitors seem larger. Look instead for the viewable-image size (VIS), which is the diagonal measurement of the image you'll see. It's typically about an inch smaller than the nominal size. As a result of a class-action suit, ads must disclose a CRT's VIS; but to find it, you may have to check the fine print. A flat-panel's VIS is the same as its nominal size, making a 15-inch flat-panel nearly the equal of a 17-inch CRT. (The CRT provides only 14 percent more viewable area.)

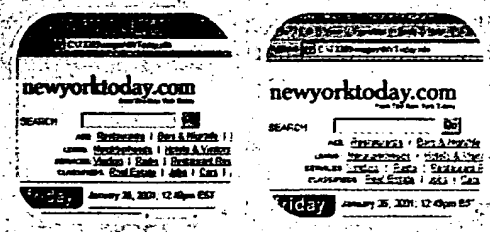
CRT: Footprint vs. image size. Footprint is the area a monitor occupies on your desktop. It's an issue only for a CRT, whose girth increases with larger screen size. To estimate whether a CRT will fit in your particular space, figure on a footprint as deep and wide as the monitor's nominal screen size. A larger screen lets you view several files simultaneously or see more of one file—more lines of text in a letter, say, with the characters large enough to be read easily. For example, a 19-inch CRT provides about 25 percent more space for images and words than a 17-inch one, but the larger CRT has a footprint about 19 inches deep. A few so-called short-depth 19-inch CRTs, such as the *Gateway VX920*, the *IBM G96*, and the *Hitachi CM771*, are an inch or two shallower than the rest, but they are still bulky.

There's no trade-off to make between a flat-panel's screen size and footprint. Even the largest flat-panels have footprints just a few inches deep, much smaller than a CRT's. (Don't confuse a flat-panel display with a flat-screen monitor, which is a CRT with its face flattened to reduce glare and reflections.)

Flat-panel vs. CRT monitor



CLOSE-UP Pixels on flat-panel (above, left) and CRT.



AT NORMAL VIEWING DISTANCE The only obvious difference is the CRT's lower contrast (above, right).

Because they rely on different technologies, flat-panels and CRTs produce different, though equally clear, images at normal viewing distances.

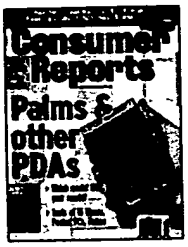
A flat-panel's squarish pixels line up in rows and columns, producing images with a slightly grainy texture especially noticeable with text. Unless viewed nearly straight on, flat-panels lose much of their contrast.

A CRT's pixels are illuminated differently, producing a softer image viewable from virtually any angle. Its images exhibit somewhat less contrast than those on a flat-panel.

YOUR LETTERS

Final arrangements

As an estate-planning and elder-law attorney, I agree with your conclusion that prepaying a funeral may not be the best use of money in most cases. There is one situation where it should be considered, however. If a person has to qualify for Medicaid, the general rule is that assets must be reduced down to $2,000 for a single person.



One standard recommendation is to prepay funeral and burial expenses. That hastens the spend-down and achieves Medicaid eligibility that much sooner. Then, upon the elder person's death, the family will not have to dig into its pockets to pay funeral bills.

K. Gabriel Heiser Brentwood, Tenn.

Your May report on prepaid funerals brought back some very painful memories. My mother paid $111 a month out of her $400 Social Security check for a prepaid funeral plan to spare my brother and me the expense and anxiety of dealing with funeral arrangements. When she died she had paid only $4,631 for the plan. The funeral cost $7,617, administrative fees were $541, and cemetery charges amounted to another $1,306. This prepaid funeral cost my brother and me $4,833.

I tell everyone who's considering a prepaid funeral plan to put the money in the bank and list a beneficiary, just as you recommended. These pre-need plans are truly unneeded.

Michael Luster Kansas City, Mo.

A prepaid funeral worked for our family. My father, who died in 1976, didn't have a prepaid funeral. Dealing with the arrangements was an emotional nightmare. After my mother remarried, I persuaded her and my stepfather to make arrangements in advance. My folks chose exactly what they wanted. Perhaps living in a small town helped. The salesman was a longtime acquaintance. When my stepfather died three years later, we were able to take care of the funeral without undue duress. Not having to "deal" in a rush of time and emotions was a blessing.

Marilyn Lynch Elk City, Okla.

Safety Assessment update

The safety reports in the April auto issue noted that the *Nissan Xterra* sport-utility vehicle tipped over during the government's side-impact crash tests. Unfortunately, you did not have access to critical information regarding that test: A high-speed tow cable interfered with one of the *Xterra's* tires, effectively tripping the vehicle and causing it to tip. Three other side-impact tests that did not involve cable interference resulted in no rollover of the *Xterra*. The government has acknowledged the problems with its test. It is misleading to say that the *Xterra* rolled over without also noting that the test was abnormal.

Debra Sanchez Fair
Vice President, Corporate Communications
Nissan North America Inc., Gardena, Calif.

The National Highway Traffic Safety Administration (NHTSA) says it doesn't know whether the Xterra rolled over solely because of the side-impact crash or because of the crash and cable interference. However, the rollover has no bearing in terms of gauging performance in that test. NHTSA does not factor rollovers into its side-impact score. Consequently, the rollover did not affect the CR Safety Assessment ranking for the Xterra. It ranked third among small SUVs, after the Mercedes-Benz ML430 and Jeep Grand Cherokee.

Cause and effect

It made my heart sing to read the May "Your Health" column about the health effects of coffee. Nearly all journalists would have assumed from the perceived effect of coffee on miscarriage that it was an obvious cause-and-effect relationship. Your writer didn't make that assumption, instead making the following statement: "You're never sure whether drinking coffee increases the risk of a miscarriage or whether many women who have a normal, healthy pregnancy just lose their taste for coffee." Bravo for understanding the difference between relationships and direct causality.

Susan Bogart Los Gatos, Calif.

Digital divides

I was appalled by the May letter to the editor from Richard Nolan, criticizing your call for subsidies to help low-income people gain Internet access. An enlightened public realizes that our society benefits when every citizen has a realistic chance at a productive life and the opportunity to fulfill his or her potential. In the digital age, fulfilling that potential requires equal access to technology.

Mary Landolfi West Orange, N.J.

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Abersfelder et al.

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[54] **SYSTEM FOR MONITORING THE FRONT OR REAR PARKING SPACE OF A MOTOR VEHICLE**

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[73] Assignee: **Mercedes-Benz AG**, Stuttgart, Germany

[21] Appl. No.: **328,671**

[22] Filed: **Oct. 25, 1994**

[30] **Foreign Application Priority Data**

Oct. 25, 1993 [DE] Germany 43 36 288.5

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[52] **U.S. Cl.** **340/932.2**; 340/903; 340/435; 348/118

[58] **Field of Search** 340/932.2, 903, 340/435, 904, 901; 348/113, 116, 118, 135, 143, 148, 149, 169, 170, 171, 172

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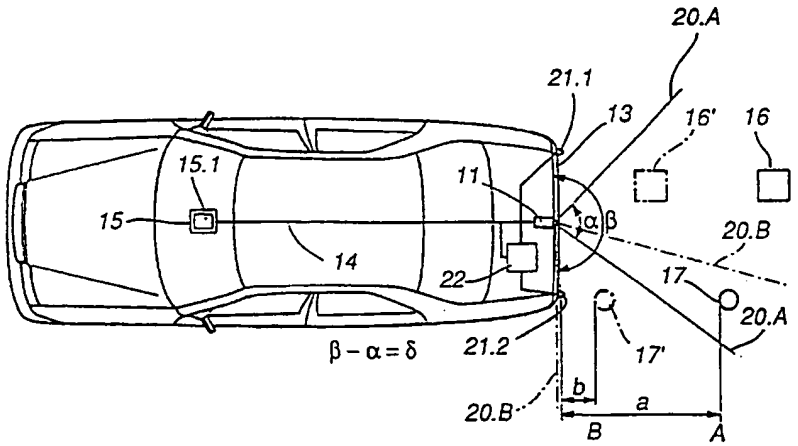
Primary Examiner—Brent A. Swarthout

Attorney, Agent, or Firm—Evenson, McKeown, Edwards & Lenahan, P.L.L.C.

[57] **ABSTRACT**

A system for monitoring the rear or front space of a motor vehicle being parked is provided. The system is based on a video camera having an image sharpness control, which can follow an object once detected, in terms of its sharpness, with the camera's autofocus over the whole search field, for example, by using fuzzy logic. The device uses this property for an image-processing-supported tracking of the viewing angle of a video camera which is designed to be pivotable and is used for rear-space or front-space monitoring, by which an object limiting the rearward or forward penetration depth of the vehicle can be seen up until contact with the vehicle's bumper. The device eliminates obstacles which previously prevented the use of such video cameras in the rear space monitoring of private cars. A corresponding device can also be provided and used for monitoring the front space of a vehicle.

12 Claims, 1 Drawing Sheet



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Derwent WPI Abstract Accession No. 92–359447/44.

Fig. 1

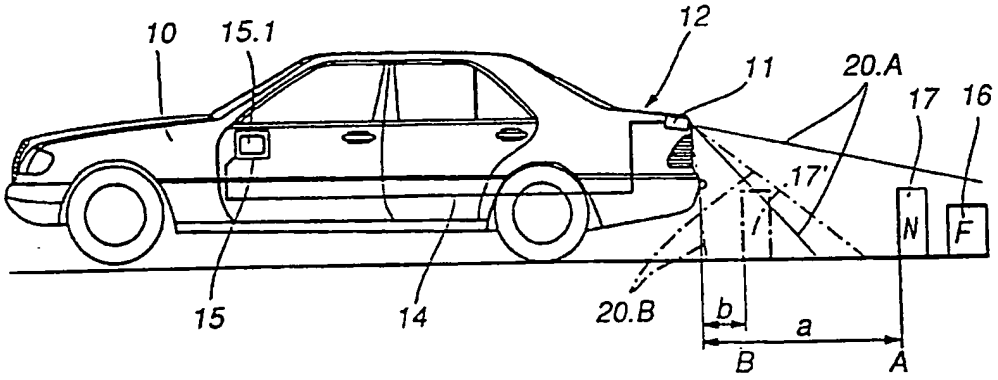


Fig. 2

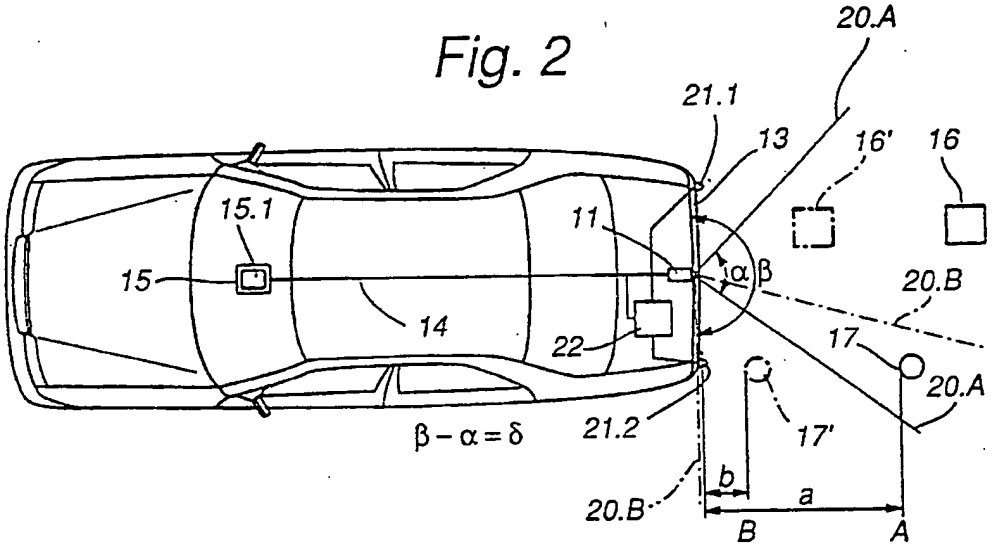


Fig. 3a

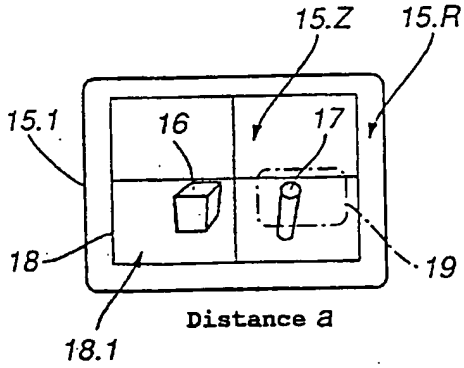
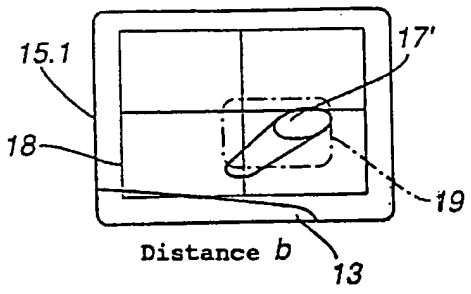


Fig. 3b



SYSTEM FOR MONITORING THE FRONT OR REAR PARKING SPACE OF A MOTOR VEHICLE

BACKGROUND AND SUMMARY OF THE INVENTION

The invention relates to a system for monitoring the front or rear parking space of a motor vehicle and, more particularly, to a system having a video camera built into either the front or rear of the vehicle and a viewing and monitoring device in the field of view of the vehicle driver connected to the camera. The field of view is fitted with a display screen.

Approach problems during the parking of vehicles, such as avoiding other vehicles, walls and the like, are well known. Known active systems which attempt to alleviate the approach problems, such as those having infrared light and/or ultrasonic sensors, suffer from a lack of measurement accuracy, reliability and reproducibility.

One alternative is represented by rear space video cameras, whose use in the area of commercial vehicles, such as airport courtesy vehicles, is already known. While the use of such video cameras, specifically in private cars, would be desirable due to the fact that parking spaces are becoming ever tighter, often requiring driving accuracy to within centimeters, the increasingly obscure rear parts of vehicles make this more difficult. The rear geometry of normal private cars, however, makes extremely wide angle lenses necessary. Unfortunately, such wide angle lenses provide the vehicle driver with an image which can hardly be interpreted.

There is therefore needed a system for monitoring the front or rear parking space of a motor vehicle which delivers to the vehicle driver a clear and easily interpretable display of the vehicle front or rear space and its boundary edges or obstacles.

These needs are met according the present invention by a system having a video camera built into either the front or rear of the vehicle and a viewing and monitoring device in the field of view of the vehicle driver connected to the camera. The field of view is fitted with a display screen. The video camera is equipped with means for its pivoting (turn and tilt) as a function of electric drive signals and is of the type having object referenced image sharpness control of its optics. This sharpness control is effective over the whole image angle detected, so that a corresponding sharpness measuring field is capable of following an object once detected over the whole screen. The system further includes an image processing unit which subdivides the image picked up into fields or quadrants and/or an edge region outside and a central region inside an auxiliary frame. The image processing unit is capable of discerning the instantaneous position of the sharpness measuring field with reference to at least one of the fields or quadrants and/or to the auxiliary frame and, as a function of a tendency of the sharpness measuring field to leave the original field/quadrant, not to reach a predetermined field or predetermined quadrant and/or to cross from the central region over the auxiliary frame out into the edge region of the image field. The image processing unit generates the above-mentioned drive signals for the pivoting means according to the measure that the pivoting of the camera thereby effected counteracts the triggering tendency or neutralizes or eliminates the triggering tendency.

The present invention makes use of the fact that modern video cameras, which increasingly are controlled by "fuzzy logic", can follow an object once detected, in terms of its sharpness, with the autofocus (AF) over the whole search field or over the whole image angle, by which means the distance measuring field or sharpness measuring field moves along with the object, that is to say, in the case of its approach or removal is virtually dragged with it. In this respect, the sharpness adjustment is no longer search-field-referenced but object referenced.

According to the present invention, this property is used for an electronic tracking of the viewing angle of such a video camera used for rear-space or front-space monitoring. Because of this, an object limiting the rearward or forward penetration depth of the vehicle can be seen up until contact, for example, with the bumper and the remaining distance up until its disappearance can be seen or easily judged.

In this case, as a whole, the device according to the invention exhibits the advantage that camera lenses of very compact construction can be used, without the requirement of extending the camera for the purposes of realizing a sufficient viewing angle. The assembly of the camera is thus possible within the vehicle contour. The image interpretation is simplified for the driver by the concentration of the image section on the essential obstacle, and complicated image processing and image preparation, as are unavoidable in the case of extreme wide angle optics, can be eliminated.

Accordingly, a "passive" system having an object-referenced guided video camera can be supported at least by means of an additional "active" system, for example an ultrasonic or infrared or laser system. Such an additional system either acts redundantly in situations in which the passive system is subject to functional limitations. Alternatively, signals from at least one such additional system support the active detection of obstacles on the camera side, for example in the case of rear space monitoring.

The use of an additional active system proves advantageous, for example in the case of obstacles having a low structure, in which autofocus control of a video camera via fuzzy logic can also fail or, on its own, delivers too large a decision time delay.

Differing from conventional active ultrasonic or light measuring systems, at least one additional system of this type can therefore be primarily used here not for warning or giving alarms, but for influencing or supporting the capture and object following behavior of the electronic autofocus function of a video camera. By means of connecting the passive system to at least one of the above-mentioned active systems in a device, the respective weaknesses of the relevant individual systems are thus overcome in any case.

As a whole, the present invention clears essential obstacles which previously stood in the way of the use of video cameras, especially in the rear space monitoring of private cars. It is self-evident, that the possibilities of use of the device according to the invention are not limited to the rear space of a vehicle; a corresponding device can nonetheless also be provided and used for monitoring the front space of a vehicle.

Other objects, advantages and novel features of the present invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic side view of the system of the present invention which is provided in a vehicle, as well as two examples of relevant obstacles in the case of rearward parking;

FIG. 2 is a schematic top view of the system, including at least one active system and corresponding sensors, built into a vehicle, as well as two examples of relevant obstacles in the case of rearward parking; and

FIGS. 3*a*, 3*b* illustrate two schematic representations of two situation displays displayed to the vehicle driver on a display screen during reversing, these displays correspond to a larger distance "a" and a smaller distance "b" of the bumper from the nearest obstacle.

DETAILED DESCRIPTION OF THE DRAWINGS

According to FIG. 1, the system according to the invention includes, for example, a video camera 11 built into the rear 12 of a vehicle 10. The following description is given by way of example for a rear space viewing system, and it is readily understood that a similar system could be used at the front of the vehicle. The camera 11 is fitted with an autofocus measuring system and is connected via a connecting lead 14 to a viewing and monitoring device 15 located in a visual range of the vehicle driver. In this case, the camera 11 can be pivoted (that is to say tilted and turned) under electronic control, by means not shown in the figure, through the angle δ shown in the top view according to FIG. 2. The viewing and monitoring device 15 has a screen 15.1 for the driver-side display of the current camera image or field of view.

Also shown is the bumper 13 and, moreover, a distant obstacle 16 or 16' designated by "F" and a near obstacle designated by "N". The near obstacle "N" is identified by 17 in the condition A of an even larger distance "a" from the rear end or bumper 13 of the vehicle 10 and identified by 17' in the condition B of a smaller distance "b" from the rear end or bumper 13 of the vehicle 10. The identifications 16 and 16' correspond, in a similar manner, to the two conditions A and B. Furthermore, the bounding beams 20.A and 20.B of the respective viewing angle α of the camera 11 in the two (stationary) conditions A and B are shown.

FIG. 2 shows the configuration according to FIG. 1 in a top view. Proceeding from the elements known from FIG. 1, the image angle α, the scan angle β, the pivoting angle δ={β–α}, and additional sensors 21.1 and 21.2 in the two end regions of the bumper 13 of at least one active ultrasonic or light-based measuring system are also shown here. The signal processing or signal evaluation of the system can be accommodated in a special module 22, in which the electronics necessary for driving the pivoting device on the camera side can also be accommodated. Such a module 22 can be connected directly to the camera or to the viewing and monitoring device 15 or can also be connected to both by means of a connection with the lead 14. Also apparent here are the bounding beams 20.A and 20.B of the respective viewing angles of the camera 11 in the two (stationary) conditions A and B.

In FIG. 3*a*, an auxiliary frame 18 with, for example, field or quadrant division 18.1 can be seen on the screen 15.1. Furthermore, the objects 16 and 17 are displayed, as seen by the camera in the condition A, that is to say in the case of an even greater distance "a" of the bumper 13 from the near object 17.

In this case, therefore, both objects 16 and 17 are still within the image angle of the camera 11 symbolized by the bounding beams 20.A. Moreover, the object 17 situated closer is within the current sharpness measuring field 19, and is therefore the image content part currently controlling the image sharpness and, in this respect, dragging the measuring field 19 with it. It is shown that, in the condition A, the camera 11 essentially still detects the whole rear space and thus all obstacles with which the vehicle could collide.

The display on the screen 15.1 according to FIG. 3*b* corresponds to the condition B in the case of an already considerably reduced distance "b" of the bumper 13 from the object situated closer, which is here identified by 17' corresponding to FIGS. 1 and 2. In this case, the field of view corresponds to the image field angle between the bounding beams 20.B in FIGS. 1 and 2.

While the object 17' is therefore still in the dragged measuring field 19 in the central region 15.Z of the screen 15.1, the distant object 16—not dominant in the central region 15.Z even in the condition A, that is to say even at a greater distance "a"—has disappeared from the original field or quadrant 18.1, over the auxiliary frame 18 and the edge region 15.R of the screen, from the field of view of the camera 11 (already intermediately pivoted). As a result of the pivoting of the camera 11—instead of the distant object 16, a portion of the rear contour of the vehicle, specifically the bumper 13, is moved into the field of view (FIG. 3*b*).

By means of the insight which has thus become possible of the ever decreasing distance b, the vehicle can thus be driven accurately to within centimeters, for example, until the bumper 13 makes contact with the near object 17'. It is understandable that, in so doing, the image angle of the camera does not have to be significantly altered, so that no complicated, long or expensive lens is necessary.

Not further shown in the figure is an image processing unit which can be realized in any arbitrary manner, and which can be accommodated or implemented either completely in the camera 11, completely in the viewing and monitoring device 15, distributed over the camera 11 and the viewing and monitoring device 15, or else accommodated or implemented mainly inside the measuring unit 22.

It is only essential for the invention that the image processing unit, as a component of the device, is capable of detecting a movement of the object-referenced sharpness measuring field 19 in the image plane and to evaluate it into at least one pivoting signal which when fed as a drive signal to the means for pivoting the camera—effects a pivoting of the camera in such a manner that the sharpness measuring field 19 optionally does not leave an original detection quadrant, reaches and fills at least one predetermined detection quadrant and/or—as far as possible—does not wander from the central region of the image field over the auxiliary frame 18 out into the edge region of the image field, that is to say out of the viewing angle of the camera.

The image-processing-supported cooperation of the camera 11 with the viewing and monitoring device 15 optionally also as a function of signals which are emitted by additional distance-detecting sensors 21.1 and 21.2 on at least one additional sonic or light-based measuring system 22, as described further below, is as follows.

Upon reaching a critical distance to an obstacle, the image processing unit seeks the nearest obstacle 17 for a further approach. In this respect, the "critical" distance is determined by means of a scan cycle while pivoting the camera through the pivoting angle δ=(β–α) [where β=scan angle, α=image angle], initially in the complete detection range of the camera (image field+pivot). Once detected, the autofocus measuring system of the camera 11 adjusts its optics to the corresponding nearest obstacle 17.

From this point in time, the near obstacle 17 is dominant, that is to say, the autofocus control of the camera, in conjunction with the above-mentioned image processing unit, effects the dragging along of the sharpness measuring

field 19 which is incident on the dominant object, independently of further relative movements between camera 11 and near obstacle 17. The image processing unit thus ensures as a whole, not only that the sharpness range corresponding to the distance or movement of the vehicle relative to the near obstacle 17, 17' in its spatial depth is displaced with reference to a contour identified once in the measuring field 19, but also that the camera is additionally pivoted in such a manner that the sharpness measuring field 19, independently of its possibly also wandering position on the screen, cannot disappear out over its edge, and also inasmuch as the obstacle of interest cannot disappear from the field of view of the vehicle driver.

During this dragging process, the correspondingly changing distance "a", "b" between the bumper 13 and the near obstacle 17, 17' can be continuously measured by suitable means and can be overlaid on the screen 15.1. For this purpose, sound and/or light measuring means, separate, or as additional means already mentioned as included in the system, are suitable.

For high measuring accuracy and a comfortable imaging size of obstacles occurring in practice and an ability to easily judge the displayed distance relations, a camera lens not having too short of a focal length has proved to be expedient. Because the image angle achievable with one such lens is not sufficient, for example also to include in the image the entire vehicle rear from a base position of the camera 11, the image processing unit ensures that if, in the case of further approach, the near object 17' wanders to the image field edge and threatens to disappear from the displayed field of view, the camera is re-pivoted in such a manner that the near object can leave the reproduced field of view of the camera only because the field of view is limited by the rear or front contour of the vehicle.

The image displayed to the vehicle driver on the screen 15.1 therefore finally shows the obstacle at the absolutely smallest possible distance "b" measured in the longitudinal direction of the vehicle, always in relation to the vehicle contour appearing somewhere on the edge of the screen, as shown, for example in FIG. 3*b* in relation to the bumper 13.

If, for example, during a rearward approach of the vehicle 10, the obstacle 16 or 17' should move out of the field of view of the camera 11 (specifically, past the vehicle towards the front), it is detected as not collision-dangerous, and the image processing unit searches for the next obstacle to be considered by means of a new scan process.

However, although an obstacle present is detected as critical and followed, it can occur that, in the meantime, an even nearer and even more relevant obstacle appears. The more relevant obstacle would then not be detectable because of a lack of sharp imaging capability (outside the measuring field 19 dragged by the obstacle already present).

In order to prevent this from occurring, the scan process mentioned above is repeated at minimum time intervals, specifically at such a rate that the vehicle driver is not disturbed during driving up to the obstacle. In this case, it is only essential that the vehicle driver is definitely presented with the important obstacle to him corresponding to the direction of driving of the vehicle.

Also lying within the scope of the present invention is that the system, instead of or additionally to means for triggering and effecting the said scan process, also includes another independent unit 22 for the detection of the respective nearest obstacle. In this case it can be, for example, a laser scanner with a moving beam or a system based on CCD image detection elements as sensors 21.1 and 21.2. In any case, these can be connected at least to the viewing and monitoring device 15 on the driver's side, so that detection results of such additional scanning devices can also be displayed on the screen 15.1 of the viewing and monitoring device 15, for example also inserted into the continuous image transmission.

It is also within the scope of the invention that the additional devices are operatively connected to the image processing unit in such a way, and the latter is designed in such a way, that it can derive data about the relevant position of an obstacle in the image field of the detection space of the additional devices, and can transmit them, at least for the pivoting pre-adjustment of the video camera for the purpose of immediate centering of its sharpness measuring field, to the pivoting means of the camera, in order to thus achieve the most rapidly possible sharp imaging of the critical obstacle.

According to the present invention, such an additional module continuously monitors the whole space behind or in front of a correspondingly equipped vehicle, in order to thus continuously detect obstacles occurring. For this purpose, the additional module has means which, for the purpose of the pivoting adjustment of the camera 11 in the event of the (wide angle) detection of a relevant obstacle, can transmit its position within the total field of view of the independent detection unit to the viewing and monitoring device 15 or directly to the camera 11 or to the pivoting means connected to the latter. This is done so that the viewing angle of the camera 11 is thus always pre adjusted or drawn towards the most relevant obstacle.

Since, in the case of obstacles having only a low structure, the autofocus function is slowed down or fails completely, the system can alternatively also include an additional ultrasonic or infrared light measuring system, which permanently monitors the space behind or in front of the vehicle.

Such a system, as a component of the device, can in this case be operated both redundantly and also as a system cooperating with the camera 11 and the viewing and monitoring device 15, which achieves for the viewing and monitoring device is an analogous function of the selection of obstacles for the pre-positioning of the camera 11.

For the purpose of optimization of the focal length of the camera lens, it has proved to be expedient to provide a pivoting and tilting angle for the camera 11 of up to about 30° from the neutral position. At such a pivoting angle, the camera 11 or its lens can still be accommodated mostly within the contour of the vehicle 10, so that good protection can be realized without greater expenditure.

What is claimed is:

1. A system for monitoring a space in front of or in a rear of a motor vehicle which is being parked, the system comprising:

a video camera built into either the front or rear of the vehicle;

a viewing and monitoring device, having a display screen, operatively coupled to said video camera, said viewing and monitoring device being located so as to be in a field of view of a driver of said vehicle;

means for pivoting said video camera as a function of electric drive signals, said video camera having object-referenced image sharpness control of its optics, said sharpness control being effective over a whole image angle detected by said video camera such that a corresponding sharpness measuring field is able to follow an object over the entire display screen once it is detected;

an image processing unit which subdivides an image picked up by said video camera into at least one of

fields, quadrants, and an edge region arranged outside and a central region arranged inside an auxiliary frame as reference fields for discriminating the object subjected to said sharpness control across the display screen, said image processing unit discerning an instantaneous position of said sharpness measuring field with reference to said at least one of the fields, quadrants and edge and central regions of the auxiliary frame;

said image processing unit generating said electric drive signals for said pivoting means to pivot the video camera such that the sharpness measuring field at least one of does not leave an original field or quadrant, reaches a predetermined field or predetermined quadrants, and does not cross from the central region over the auxiliary frame into the edge region of the image field, so as to one of counteract, neutralize and eliminate a sampling pivoting of the video camera from being triggered.

2. A system according to claim 1, wherein said object-referenced image sharpness control is carried out using fuzzy logic.

3. A system according to claim 1, wherein said image processing unit is designed such that at least one of: before the detection of a nearest obstacle and after the loss of detection of a sharpness dominant near obstacle, at least one sampling pivoting of the camera is triggered, fully covering a pivoting angle δ of the video camera in order to detect a most complete field of view (β) possible.

4. A system according to claim 3, wherein said image processing unit is further designed such that, during a sequence of following a sharpness-dominant near obstacle, said image processing unit undertakes a corresponding cyclical scan sequence at high speed, for detecting newly occurring obstacles.

5. A system according to claim 4, further comprising means for electronically storing a last respective image, and in that the image picked up during a cyclic pivoting scan sequence of the video camera is blanked out and can be displayed on the screen together with an added warning marker instead of the last image displayed and stored before the scan sequence, and in that an immediate insertion of a screen image from the cyclic scan sequence currently in the process of being carried out takes place when the image processing unit recognizes, in so doing, a near obstacle more critical than that already currently in the process of being followed.

6. A system according to claim 1, further comprising at least one of additional active sound-based and light-based means and sensors cooperating with said system for the detection of the respective nearest obstacle.

7. A system according to claim 6, wherein said additional means are connected at least to said viewing and monitoring device on a driver's side, and in that detection results of said additional means can be displayed on the displaying screen of said viewing and monitoring device.

8. A system according to claim 6, wherein said additional means are operationally connected to said image processing unit, said image processing unit being designed such that it can derive data for a relevant obstacle via its relative position in the image field of a detection space of the additional means, and can transmit the data, at least for a pivoting preadjustment of the video camera for the purpose of immediate centering of its sharpness measuring field, to the pivoting means of the video camera.

9. A system according to claim 1, further comprising laser scanning means for detecting a respective nearest obstacle using a moving beam.

10. A system according to claim 9, wherein said laser scanning means are connected at least to said viewing and monitoring device on the driver's side, and in that detection results of the laser scanning means can likewise be displayed on the display screen of said viewing and monitoring device.

11. A system according to claim 1, further comprising means for allowing the distance of the vehicle from the currently nearest obstacle to be measured and co-indicated on the display screen during a continuous detection and display of a distance situation to the currently nearest obstacle.

12. A system according to claim 11, wherein at least one of sound and light measuring means are used.

* * * * *

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United States Patent [19]

Aviv

[11] Patent Number: 5,666,157

[45] Date of Patent: Sep. 9, 1997

[54] **ABNORMALITY DETECTION AND SURVEILLANCE SYSTEM**

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[73] Assignee: **ARC Incorporated**, New York, N.Y.

[21] Appl. No.: **367,712**

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[51] **Int. Cl.**[6] **H04N 7/18**

[52] **U.S. Cl.** **348/152**; 348/150; 348/154; 348/155; 348/161

[58] **Field of Search** 348/143, 161, 348/150, 154, 155, 152; H04N 7/18

[56] **References Cited**

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Primary Examiner—Howard W. Britton
Attorney, Agent, or Firm—Darby & Darby

[57] **ABSTRACT**

A surveillance system having at least one primary video camera for translating real images of a zone into electronic video signals at a first level of resolution. The system includes means for sampling movements of an individual or individuals located within the zone from the video signal output from at least one video camera. Video signals of sampled movements of the individual is electronically compared with known characteristics of movements which are indicative of individuals having a criminal intent. The level of criminal intent of the individual or individuals is then determined and an appropriate alarm signal is produced.

4 Claims, 5 Drawing Sheets

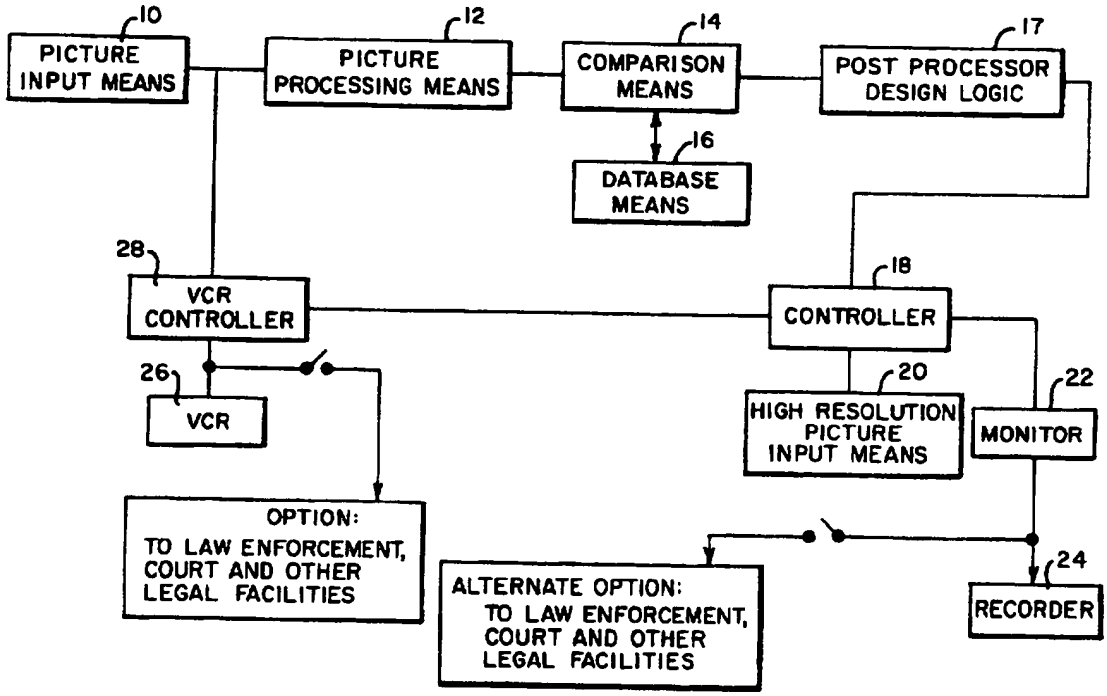


FIG. 1

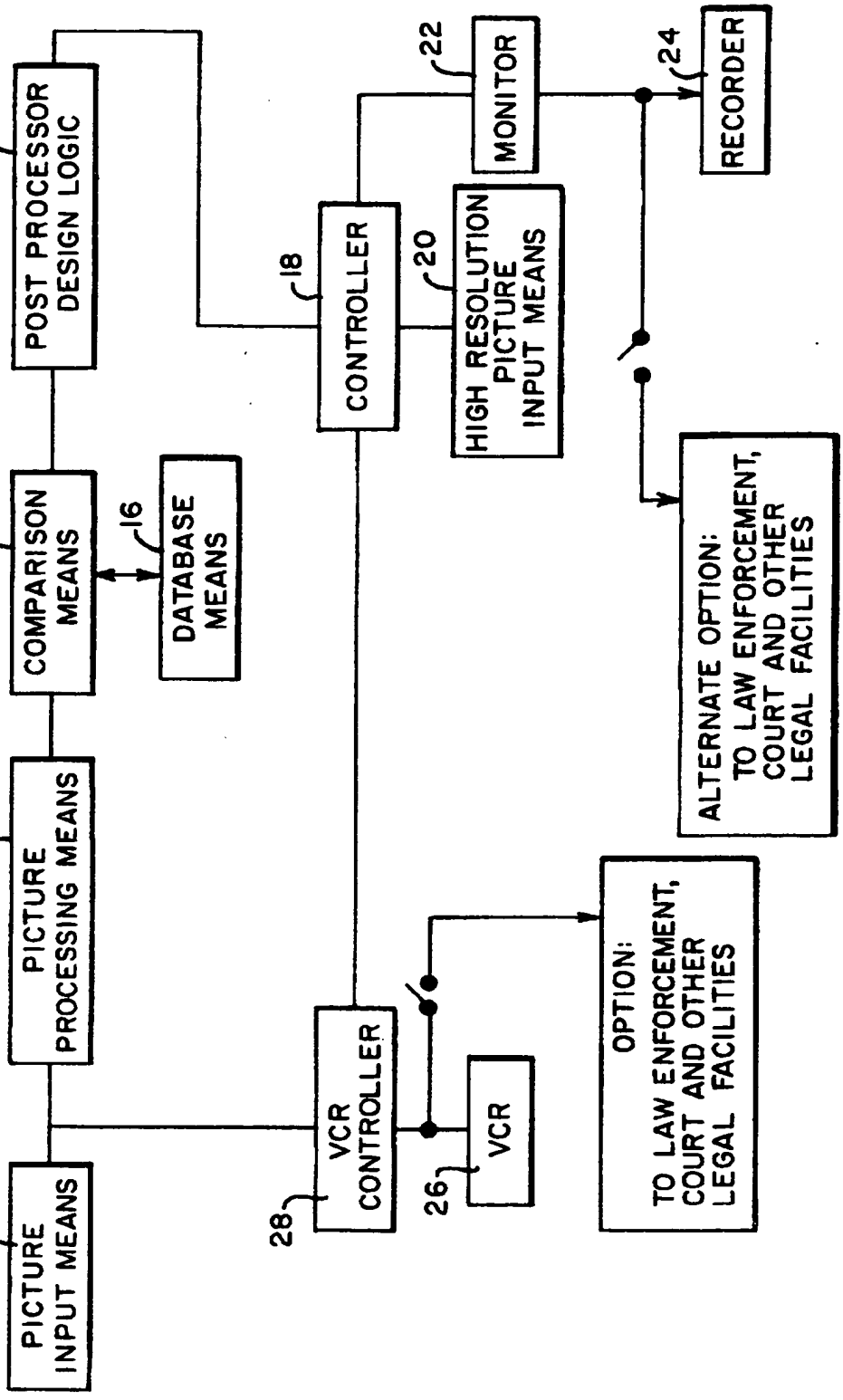

PICTURE INPUT MEANS
10
PICTURE PROCESSING MEANS
12
COMPARISON MEANS
14
DATABASE MEANS
16
POST PROCESSOR DESIGN LOGIC
17
CONTROLLER
18
HIGH RESOLUTION PICTURE INPUT MEANS
20
MONITOR
22
RECORDER
24
VCR
26
VCR CONTROLLER
28
OPTION: TO LAW ENFORCEMENT, COURT AND OTHER LEGAL FACILITIES
ALTERNATE OPTION: TO LAW ENFORCEMENT, COURT AND OTHER LEGAL FACILITIES

FIG. 2A

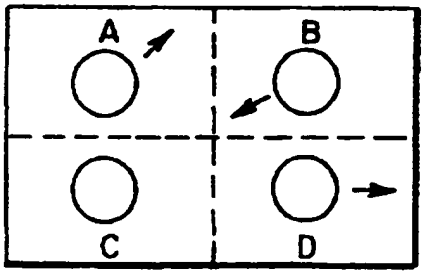


FIG. 2B

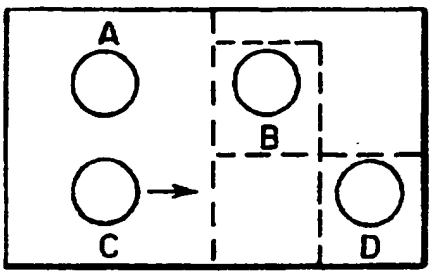


FIG. 2C

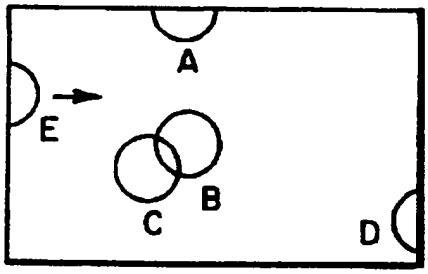


FIG. 2D

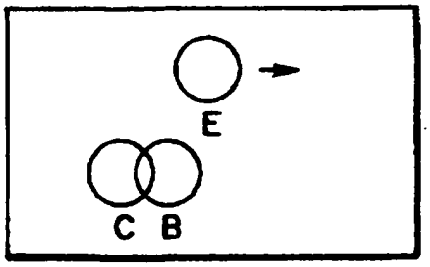


FIG. 2E

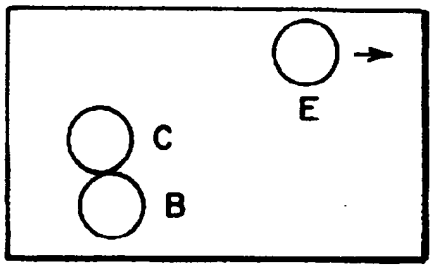
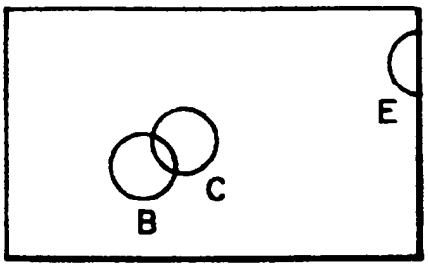


FIG. 2F



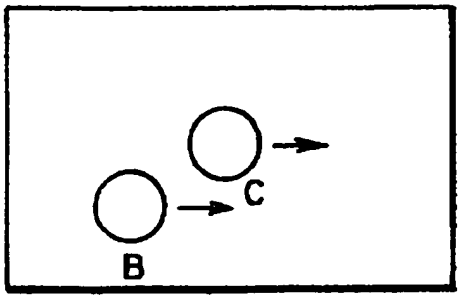


FIG. 2G

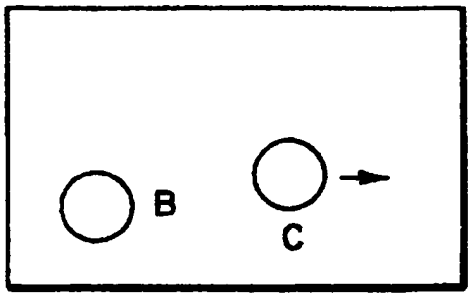


FIG. 2H

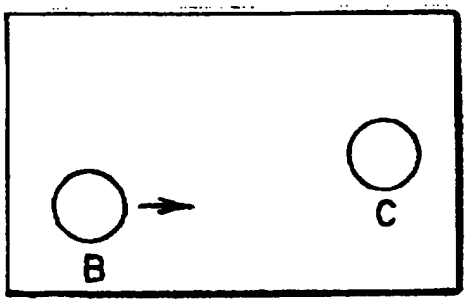


FIG. 2I

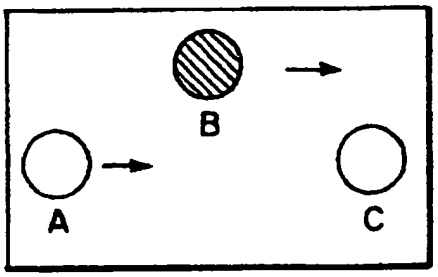
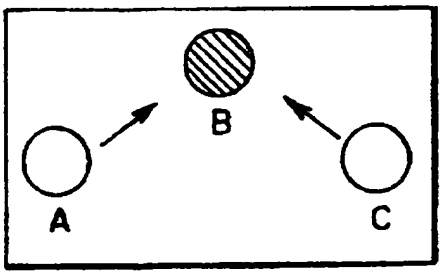


FIG. 3A

FIG. 3B



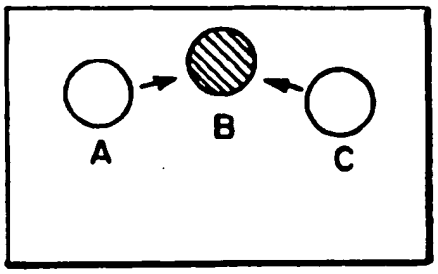


FIG. 3C

FIG. 3D

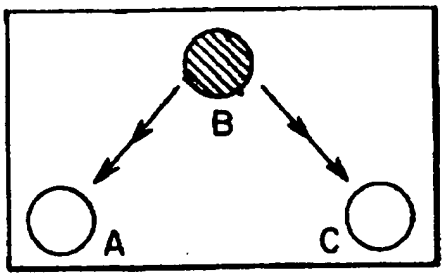
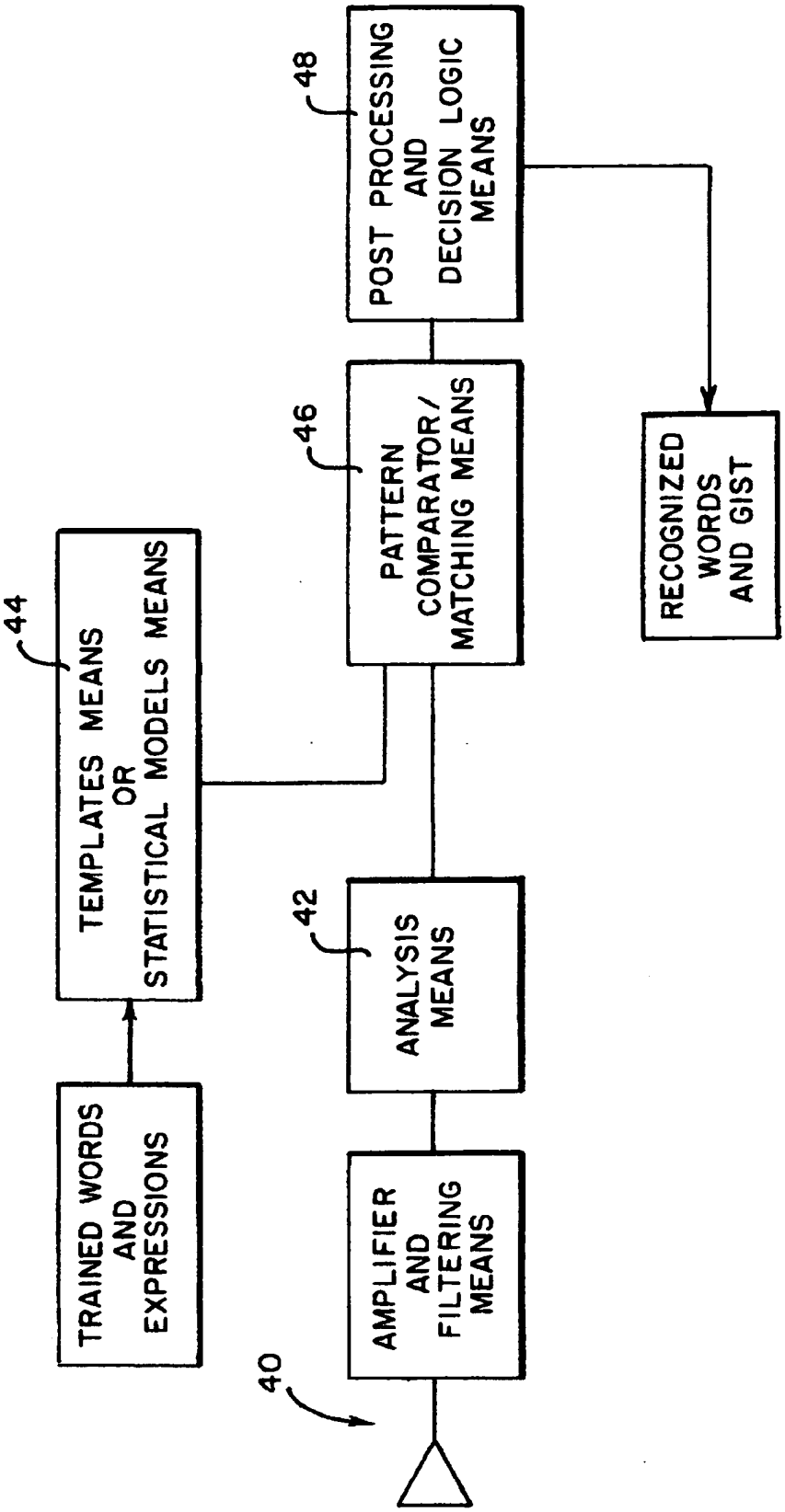


FIG. 4


40
AMPLIFIER AND FILTERING MEANS
42
ANALYSIS MEANS
44
TEMPLATES MEANS OR STATISTICAL MODELS MEANS
46
PATTERN COMPARATOR/ MATCHING MEANS
48
POST PROCESSING AND DECISION LOGIC MEANS
TRAINED WORDS AND EXPRESSIONS
RECOGNIZED WORDS AND GIST

ABNORMALITY DETECTION AND SURVEILLANCE SYSTEM

FIELD OF THE INVENTION

This invention generally relates to surveillance systems, and more particularly, to trainable surveillance systems which detect and respond to specific abnormal video and audio input signals.

BACKGROUND OF THE INVENTION

Today's surveillance systems vary in complexity, efficiency and accuracy. Earlier surveillance systems use several closed circuit cameras, each connected to a devoted monitor. This type of system works sufficiently well for low-coverage sites, i.e., areas requiring up to perhaps six cameras. In such a system, a single person could scan the six monitors, in "real" time, and effectively monitor the entire (albeit small) protected area, offering a relatively high level of readiness to respond to an abnormal act or situation observed within the protected area. In this simplest of surveillance systems, it is left to the discretion of security personnel to determine, first, if there is any abnormal event in progress within the protected area, second, the level of concern placed on that particular event, and third, what actions should be taken in response to the particular event. The reliability of the entire system depends on the alertness and efficiency of the worker observing the monitors.

Many surveillance systems, however, require the use of a greater number of cameras (e.g., more than six) to police a larger area, such as at least every room located within a large museum. To adequately ensure reliable and complete surveillance within the protected area, either more personnel must be employed to constantly watch the additionally required monitors (one per camera), or fewer monitors may be used on a simple rotation schedule wherein one monitor sequentially displays the output images of several cameras, displaying the images of each camera for perhaps a few seconds. In another prior art surveillance system (referred to as the "QUAD" system), four cameras are connected to a single monitor whose screen continuously and simultaneously displays the four different images. In a "quaded quad" prior art surveillance system, sixteen cameras are linked to a single monitor whose screen now displays, continuously and simultaneously all sixteen different images. These improvements flow fewer personnel to adequately supervise the monitors to cover the larger protected area.

These improvements, however, still require the constant attention of at least one person. The above described multiple-image/single screen systems suffered from poor resolution and complex viewing. The reliability of the entire system is still dependent on the alertness and efficiency of the security personnel watching the monitors. The personnel watching the monitors are still burdened with identifying an abnormal act or condition shown on one of the monitors, determining which camera, and which corresponding zone of the protected area is recording the abnormal event, determining the level of concern placed on the particular event, and finally, determining the appropriate actions that must be taken to respond to the particular event.

Eventually, it was recognized that human personnel could not reliably monitor the "real-time" images from one or several cameras for long "watch" periods of time. It is natural for any person to become bored while performing a monotonous task, such as staring at one or several monitors continuously, waiting for something unusual or abnormal to occur, something which may never occur.

As discussed above, it is the human link which lowers the overall reliability of the entire surveillance system. U.S. Pat. No. 4,737,847 issued to Araki et al. discloses an improved abnormality surveillance system wherein motion sensors are positioned within a protected area to first determine the presence of an object of interest, such as an intruder. In the system disclosed by U.S. Pat. No. 4,737,847, zones having prescribed "warning levels" are defined within the protected area. Depending on which of these zones an object or person is detected in, moves to, and the length of time the detected object or person remains in a particular zone determines whether the object or person entering the zone should be considered an abnormal event or a threat.

The surveillance system disclosed in U.S. Pat. No. 4,737,847 does remove some of the monitoring responsibility otherwise placed on human personnel; however, such a system can only determine an intruder's "intent" by his presence relative to particular zones. The actual movements and sounds of the intruder are not measured or observed. A skilled criminal could easily determine the warning levels of obvious zones within a protected area and act accordingly; spending little time in zones having a high warning level, for example.

It is therefore an object of the present invention to provide a surveillance system which overcomes the problems of the prior art.

It is another object of the invention to provide such a surveillance system wherein a potentially abnormal event is determined by a computer prior to summoning a human supervisor.

It is another object of the invention to provide a surveillance system which compares specific measured movements of a particular person or persons with a trainable, predetermined set of "typical" movements to determine the level and type of a criminal or mischievous event.

It is another object of this invention to provide a surveillance system which transmits the data from various sensors to a location where it can be recorded for evidentiary purposes. It is another object of this invention to provide such a surveillance system which is operational day and night.

It is another object of this invention to provide a surveillance system which can cull out real-time events which indicate criminal intent using a weapon, by resolving the low temperature of the weapon relative to the higher body temperature and by recognizing the stances taken by the person with the weapon.

It is yet another object of this invention to provide a surveillance system which eliminates or reduces the number of TV monitors and guards presently required to identify abnormal events, as this system will perform this function in near real time.

INCORPORATED BY REFERENCE

The content of the following references is hereby incorporated by reference.

1. Motz L. and L. Bergstein "Zoom Lens Systems", Journal of Optical Society of America, 3 papers in Vol. 52, 1992.

2. D. G. Aviv, "Sensor Software Assessment of Advanced Earth Resources Satellite Systems", ARC Inc. Report #70-80-A, pp. 2-107 through 2-119; NASA contract NAS-1-16366.

3. Shio, A. and J. Sklansky "Segmentation of People in Motion", Proc. of IEEE Workshop on Visual Motion, Princeton, N.J., October 1991.

4. Agarwal, R. and J Sklansky "Estimating Optical Flow from Clustered Trajectory Velocity Time".

5. Suzuki, S. and J Sklansky "Extracting Non-Rigid Moving Objects by Temporal Edges", IEEE, 1992, Transactions of Pattern Recognition.

6. Rabiner, L. and Biing-Hwang Juang "Fundamental of Speech Recognition", Pub. Prentice Hall, 1993, (p.434–495).

7. Weibel, A. and Kai-Fu Lee Eds. "Readings in Speech Recognition", Pub. Morgan Kaaufman, 1990 (p.267–296).

8. Rabiner L. "Application of Voice Processing to Telecommunication", Proc. IEEE, Vol. 82, No. 2, February, 1994.

SUMMARY OF THE INVENTION

A preferred embodiment of the herein disclosed invention involves a surveillance system having at least one primary video camera for translating real images of a zone into electronic video signals at a first level of resolution and means for sampling movements within the zone from the video camera output. These elements are combined with means for electronically comparing the sampled movements with known characteristics of movements which are indicative of individuals engaged in criminal activity and means for determining the level of such criminal activity. Associated therewith are means for activating at least one secondary sensor and associated recording device having a second higher level of resolution, said activating means being in response to determining a predetermined level of criminal activity.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic block diagram of the video, analysis, control, alarm and recording subsystems of an embodiment of this invention;

FIG. 2A illustrates a frame K of a video camera's output of a particular environment, according to the invention, showing four representative objects (people) A, B, C, and D, wherein objects A, B and D are moving in a direction indicated with arrows, and object C is not moving;

FIG. 2B illustrates a frame K+5 of the video camera's output, according to the invention, showing objects A, B, and D are stationary, and object C is moving;

FIG. 2C illustrates a frame K+10 of the video camera's output, according to the invention, showing the current location of object A, B, C, D, and E;

FIG. 2D illustrates a frame K+11 of the video camera's output, according to the invention, showing object B next to object C, and object E moving to the right;

FIG. 2E illustrates a frame K+12 of the video camera's output, according to the invention, showing a potential crime taking place between objects B and C;

FIG. 2F illustrates a frame K+13 of the video camera's output, according to the invention, showing objects B and C interacting;

FIG. 2G illustrates a frame K+15 of the video camera's output, according to the invention, showing object C moving the right and object B following;

FIG. 2H illustrates a frame K+16 of the video camera's output, according to the invention, showing object C moving away from a stationary object B;

FIG. 2I illustrates a frame K+17 of the video camera's output, according to the invention, showing object B moving towards object C;

FIG. 3A illustrates a frame of a video camera's output, according to the invention, showing a "two on one" interaction of objects (people) A, B, and C;

FIG. 3B illustrates a later frame of the video camera's output of FIG. 3A, according to the invention, showing objects A and C moving towards object B;

FIG. 3C illustrates a later frame of the video camera's output of FIG. 3B, according to the invention, showing objects A and C moving in close proximity to object B;

FIG. 3D illustrates a later frame of the video camera's output of FIG. 3C, according to the invention, showing objects A and C quickly moving away from object B;

FIG. 4 is a schematic block diagram of a conventional word recognition system which may be employed in the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, the picture input means 10, may be any conventional electronic picture pickup device operational within the infrared or visual spectrum (or both) including a vidicon and a CCD/TV camera of moderate resolution, e.g., a camera about 1½ inches in length and about 1 inch in diameter, weighing about 3 ounces, including for particular deployment a zoom lens attachment. This device is intended to operate continuously and translate the field of view ("real") images within a first observation area into conventional video electronic signals.

Alternatively, a high rate camera/recorder, up to 300 frames/sec (similar to those made by NAC Visual Systems of Woodland Hills, Calif., SONY and others) may be used as the picture input means 10. This would enable the detection of even the very rapid movement of body parts that are indicative of criminal intent, and their recording, as hereinbelow described. The more commonly used camera operates at 30 frames per second and cannot capture such quick body movement with sufficient resolution.

Picture input means 10, instead of operating continuously, may be activated by an "alert" signal from the processor of the low resolution camera or from the audio/word recognition processor when sensing a suspicious event.

Picture input means 10 contains a preprocessor which normalizes a wide range of illumination levels, especially for outside observation. The preprocessor emulates a vertebrate's retina, which has a an efficient and accurate normalization process. One such preprocessor (VLSI retina chip) is fabricated by the Carver Meade Laboratory of the California Institute of Technology in Pasadena, Calif. Use of this particular preprocessor chip will increase the automated vision capability of this invention whenever variation of light intensity and light reflection may otherwise weaken the picture resolution.

The signals from the picture input means 10 are converted into digitized signals and then sent to the picture processing means 12. The processor means controlling each group of cameras will be governed by an artificial intelligence system, based on dynamic pattern recognition principles, as further described below. Picture processing means 12 includes an image raster analyzer which effectively segments each image to isolate each pair of people. The image raster analyzer subsystem of picture processing means 12 segments each sampled image to identify and isolate each pair of objects (or people), and each "two on one" group of three people separately.

The "two on one" grouping represents a common mugging situation in which two individuals approach a victim,

one from in front of the victim and the other from behind. The forward mugger tells the potential victim that if he does not give up his money, (or watch, ring, etc.) the second mugger will shoot him, stab or otherwise harm him. The group of three people will thus be considered a potential crime in progress and will therefore be segmented and analyzed in picture processing means.

With respect to a zoom lens system useful as an element in the picture input means **10**, the essentials of the zoom lens subsystem are described in three papers written by L. Motz and L. Bergstein, in an article titled "Zoom Lens Systems" in the Journal of Optical Society of America, Vol. 52, April, 1992. This article is hereby incorporated by reference.

The essence of the zoom system is to vary the focal length such that an object being observed will be focused and magnified at its image plane. In an automatic version of the zoom system, once an object is in the camera's field-of-view (FOV), the lens moves to focus the object onto the camera's image plane. An error signal which is used to correct the focus by the image planes is generated by a CCD array into two halves and measuring the difference, segmenting in each until the object is at the center. Dividing the CCD array into more than two segments, say four quadrants, is a way to achieve automatic centering, as is the case with mono-pulse radar. Regardless of the number of segments, the error signal is used to generate the desired tracking of the object.

In a wide field-of-view (WFOV) operation, there may be more than one object, thus special attention is given to the design of the zoom system and its associated software and firmware control. Assuming three objects, as is the "two on one" potential mugging threat described above, and that the three persons are all in one plane, one can program a shifting from one object to the next, from one face to another face, in a prescribed sequential order. Moreover, as the objects move within the WFOV they will be automatically tracked in azimuth and elevation. In principle, the zoom would focus on the nearest object, assuming that the mount of light on each object is the same so that the prescribed sequence starting from the closes object will proceed to the remaining objects from, for example, right to left.

However, when the three objects are located in different planes, but still within the camera's WFOV, the zoom, with input from the segmentation subsystem of the picture analysis means **12** will focus on the object closest to the right hand side of the image plane, and then proceed to move the focus to the left, focusing on the next object and on the next sequentially.

In all of the above cases, the automatic zoom can more naturally choose to home-in on the person with the brightest emission or reflection, and then proceed to the next brightness and so forth. This would be a form of an intensity/time selection multiplex zoom system.

The relative positioning of the input camera with respect to the area under surveillance will effect the accuracy by which the image raster analyzer segments each image. In this preferred embodiment, it is beneficial for the input camera to view the area under surveillance from a point located directly above, e.g., with the input camera mounted high on a wall, a utility tower, or a traffic light support tower. The height of the input camera is preferably sufficient to minimize occlusion between the input camera and the movement of the individuals under surveillance.

Once the objects within each sampled video frame are segmented (i.e., detected and isolated), an analysis is made of the detailed movements of each object located within each particular segment of each image, and their relative movements with respect to the other objects.

Each image frame segment, once digitized, is stored in a frame by frame memory storage of picture processing means **12**. Each frame from the picture input means **10** is subtracted from a previous frame already stored in processing means **12** using any conventional differencing process. The differencing process involving multiple differencing steps takes place in the processing section **12**. The resulting difference signal (outputted from the differencing sub-section of means **12**) of each image indicates all the changes that have occurred from one frame to the next. These changes include any movements of the individuals located within the segment and any movements of their limbs, e.g., arms.

Referring to FIG. **3**, a collection of differencing signals for each moved object of subsequent sampled frames of images (called a "track") allows a determination of the type, speed and direction (vector) of each motion involved, processing which will extract acceleration, i.e., note of change of velocity: and change in acceleration with respect to time (called "jerkiness"), and correlating this with stored signatures of known physical criminal acts. For example, subsequent differencing signals may reveal that an individual's arm is moving to a high position, such as the upper limit of that arm's motion, i.e., above his head) at a fast speed. This particular movement could be perceived, as described below, as a hostile movement with a possible criminal activity requiring the expert analysis of security personnel.

The intersection of two tracks indicates the intersection of two moved objects. The intersecting objects, in this case, could be merely the two hands of two people greeting each other, or depending on other characteristics, as described below, the intersecting objects could be interpreted as a fist of an assailant contacting the face of a victim in a less friendly greeting. In any event, the intersection of two tracks immediately requires further analysis and/or the summoning of security personnel. But the generation of an alarm, fight and sound devices located, for example, on a monitor will turn a guard's attention only to that monitor, hence the labor savings. In general however, friendly interactions between individuals is a much slower physical process than is a physical assault vis-a-vis body parts of the individuals involved. Hence, friendly interactions may be easily distinguished from hostile physical acts using current low pass and high pass filters, and current pattern recognition techniques based on experimental reference data.

When a large number of sensors (called a sensor suite) are distributed over a large number of facilities, for example, a number of ATMs (automatic teller machines), associated with particular bank branches and in a particular state or states and all operated under a single bank network control, then only one monitor is required.

A commercially available software tool may enhance object-movement analysis between frames (called optical flow computation). With optical flow computation, specific (usually bright) reflective elements, called farkles, emitted from the clothing and/or the body parts of an individual of one frame are subtracted from a previous frame. The bright portions will inherently provide sharper detail and therefore will yield more accurate data regarding the velocities of the relative moving objects. Additional computation, as described below, will provide data regarding the acceleration and even change in acceleration or "jerkiness" of each moving part sampled.

The physical motions of the individuals involved in an interaction, will be detected by first determining the edges of the of each person imaged. And the movements of the body parts will then be observed by noting the movements of the

edges of the body parts of the individuals involved in the interaction. The differencing process will enable the determination of the velocity and acceleration and rate of acceleration of those body parts.

The now processed signal is sent to comparison means **14** which compares selected flames of the video signals from the picture input means **10** with "signature" video signals stored in memory **16**. The signature signals are representative of various positions and movements of the body ports of an individual having various levels of criminal intent. The method for obtaining the data base of these signature video signals in accordance with another aspect of the invention is described in greater detail below.

If a comparison is made positive with one or more of the signature video signals, an output "alert" signal is sent from the comparison means **14** to a controller **18**. The controller **18** controls the operation of a secondary, high resolution picture input means (video camera) **20** and a conventional monitor **22** and video recorder **24**. The field of view of the secondary camera **20** is preferably at most, the same as the field of view of the primary camera **10**, surveying a second observation area. The recorder **24** may be located at the site and/or at both a law enforcement facility (not shown) and simultaneously at a court office or legal facility to prevent loss of incriminating information due to tampering.

The purpose of the secondary camera **20** is to provide a detailed video signal of the individual having assumed criminal intent and also to improve false positive and false negative performance. This information is recorded by the video recorder **24** and displayed on a monitor **22**. An alarm bell or light (not shown) or both may be provided and activated by an output signal from the controller **20** to summon a supervisor to immediately view the pertinent video images showing the apparent crime in progress and access its accuracy.

In still another embodiment of the invention, a VCR **26** is operating continuously (using a 6 hour loop-tape, for example). The VCR **26** is being controlled by the VCR controller **28**. All the "real-time" images directly from the picture input means **10** are immediately recorded and stored for at least 6 hours, for example. Should it be determined that a crime is in progress, a signal from the controller **18** is sent to the VCR controller **28** changing the mode of recording from tape looping mode to non-looping mode. Once the VCR **26** is changed to a non-looping mode, the tape will not re-loop and will therefore retain the perhaps vital recorded video information of the surveyed site, including the crime itself, and the events leading up to the crime.

When the non-looping mode is initiated, the video signal may also be transmitted to a VCR located elsewhere; for example, at a law enforcement facility and, simultaneously to other secure locations of the Court and its associated offices.

Prior to the video signals being compared with the "signature" signals stored in memory, each sampled frame of video is "segmented" into parts relating to the objects detected therein. To segment a video signal, the video signal derived from the vidicon or CCD/TV camera is analyzed by an image raster analyzer. Although this process causes slight signal delays, it is accomplished nearly in real time.

At certain sites, or in certain situations, a high resolution camera may not be required or otherwise used. For example, the resolution provided by a relatively simple and low cost camera may be sufficient. Depending on the level of security for the particular location being surveyed, and the time of day, the length of frame intervals between analyzed frames may vary. For example, in a high risk area, every frame from the CCD/TV camera may be analyzed continuously to ensure that the maximum amount of information is recorded prior to and during a crime. In a low risk area, it may be preferred to sample perhaps every 10 frames from each camera, sequentially.

If, during such a sampling, it is determined that an abnormal or suspicious event is occurring, such as two people moving very close to each other, then the system would activate an alert mode wherein the system becomes "concerned and curious" in the suspicious actions and the sampling rate is increased to perhaps every 5 frames or even every frame. As described in greater detail below, depending on the type of system employed (i.e., video only, audio only or both), during such an alert mode, the entire system may be activated wherein both audio and video system begin to sample the environment for sufficient information to determine the intent of the actions.

Referring to FIG. 2, several frames of a particular camera output are shown to illustrate the segmentation process performed in accordance with the invention. The system begins to sample at frame K and determines that there are four objects (previously determined to be people, as described below), A-D located within a particular zone being policed. Since nothing unusual is determined from the initial analysis, the system does not warrant an "alert" status. People A, B, and D are moving according to normal, non-criminal intent, as could be observed.

A crime likelihood is indicated when frames K+10 through K+13 are analyzed by the differencing process. And if the movement of the body parts indicate velocity, acceleration and "jerkiness" that compare positively with the stored digital signals depicting movements of known criminal physical assaults, it is likely that a crime is in progress here.

Additionally, if a high velocity of departure is indicated when person C moves away from person B, as indicated in frames K+15 through K+17, a larger level of confidence, is attained in deciding that a physical criminal act has taken place or is about to.

An alarm is generated the instant any of the above conditions is established. This alarm condition will result in sending in Police or Guards to the crime site, activating the high resolution CCD/TV camera to record the face of the person committing the assault, a loud speaker being activated automatically, playing a recorded announcement warning the perpetrator the seriousness of his actions now being undertaken and demanding that he cease the criminal act. After dark a strong light will be turned on automatically. The automated responses will be actuated the instant an alarm condition is determined by the processor. Furthermore, an alarm signal is sent to the police station, and the same video signal of the event is transmitted to a court appointed data collection office, to the Public Defender's office and the District Attorney's Office.

As described above, it is necessary to compare the resulting signature of physical body parts motion involved in a physical criminal act, that is expressed by specific motion characteristics (i.e., velocity, acceleration, change of acceleration), with a set of signature files of physical criminal acts, in which body parts motion are equally involved. This comparison, is commonly referred to as pattern matching and is part of the pattern recognition process.

Files of physical criminal acts, which involve body parts movements such as hands, arms, elbows, shoulder, head, torso, legs, and feet, can be reviewed to ascertain this

pattern. In addition, a priority can be set by experiments and simulations of physical criminal acts gathered from "dramas" that are enacted by professional actors, the data gathered from experienced muggers who have been caught by the police as well as victims who have reported details of their experiences will help the actors perform accurately. Video of their motions involved in these simulated acts can be stored in digitized form and files prepared for signature motion of each of the body parts involved, in the simulated physical criminal acts.

In another embodiment, the above described Abnormality Detection System includes an RF-ID (Radio Frequency Identification) tag or card to assist in the detection and tracking of individuals within the field of view of a camera. Such cards or tags could be used by authorized individuals to respond when queried by the RF interrogator. The response signal of the tags propagation pattern which is adequately registered with the video sensor. The card or tag, when sensed in video, would be assumed friendly and authorized. This information would simplify the segmentation process.

A light connected to each RF-ID card will be turned ON, when a positive response to an interrogation signal is established. The light will appear on the computer generated grid (also on the screen of the monitor) and the intersection of tracks clearly indicated, followed by their physical interaction. But also noted will be the intersection between the tagged and the untagged individuals. In all of such cases, the segmentation process will be simpler.

There are many manufacturers of RF-ID cards and Interrogators, three major ones are, The David Samoff Research Center of Princeton, N.J., AMTECH of Dallas, Tex. and MICRON Technology of Boise, Id.

The applications of the present invention include banks, ATMs, hotels, schools, residence halls and dormitories, office and residential buildings, hospitals, sidewalks, street crossings, parks, containers and container loading areas, shipping piers, train stations, truck loading stations, airport passenger and freight facilities, bus stations, subway stations, theaters, concert halls, sport arenas, libraries, churches, museums, stores, shopping malls, restaurants, convenience stores, bars, coffee shops gasoline stations, highway rest stops, tunnels, bridges, gateways, sections of highways, toll booths, warehouses, and depots, factories and assembly rooms, law enforcement facilities including jails. Any location or facility, civilian or military, requiring security would be a likely application.

Further applications of this invention are in moving platforms: automobiles, trucks, buses, subway cars, train cars, both freight and passenger, boats, ships (passenger and freight), tankers, service and construction vehicles, on and off-road, containers and their carriers, and airplanes, and also in equivalent military and sensitive mobile platforms.

As a deterrence to car-jacking a tiny CCD/TV camera hidden in the ceiling or the rearview mirror of the car, and focussed through a pin hole lens to the driver's seat, may be connected to the video processor to record the face of the drive. The camera is triggered by the automatic word recognition processor that will identify the well known expressions commonly used by the car-jacker. The video picture will be recorded and then transmitted via cellular phone in the car. Without a phone, the short video recording of the face of the car-jacker will be held until the car is found by the police, but now with the evidence (the picture of the car-jacker) in hand.

In this present surveillance system, the security personnel manning the monitors are alerted only to video images which show suspicious actions (criminal activities) within a prescribed observation zone. The security personnel are therefore used to access the accuracy of the crime and determine the necessary actions for an appropriate response. By using computers to effectively filter out all normal and noncriminal video signals from observation areas, fewer security personnel are required to survey and "secure" a greater overall area (including a greater number of observation areas. i.e., cameras).

It is also contemplated that the present system could be applied to assist blind people "see". A battery operated portable version of the video system would automatically identify known objects in its field of view and a speech synthesizer would "say" the object. For example, "chair", "table", etc. would indicate the presence of a chair and a table.

Depending on the area to be policed, it is preferable that at least two and perhaps three cameras (or video sensors) are used simultaneously to cover the area. Should one camera sense a first level of criminal action, the other two could be manipulated to provide a three dimensional perspective coverage of the action. The three dimensional image of a physical interaction in the policed area would allow observation of a greater number of details associated with the steps: accost, threat, assault, response and post response. The conversion process from the two dimensional image to the three dimensional image is achieved by use of the known Radon transform.

In the extended operation phase of the invention as more details of the physical variation of movement characteristics of physical threats and assaults against a victim and also the speaker independent (male, female of different ages groups) and dialect independent words and terse sentences, with corresponding responses, will enable automatic recognition of a criminal assault, without be need of guard, unless required by statutes and other external requirements.

In another embodiment of the present invention, both video and acoustic information is sampled and analyzed. The acoustic information is sampled and analyzed in a similar manner to the sampling and analyzing of the above-described video information. The audio information is sampled and analyzed in a manner shown in FIG. 4, and is based on prior art.

The employment of the audio speech band, with its associated Automatic Speech Recognition (ASR) system, will not only reduce the false alarm rate resulting from the video analysis, but can also be used to trigger the video and other sensors if the sound threat predates the observed threat.

Referring to FIG. 4, a conventional automatic word recognition system is shown, including an input microphone system **40**, an analysis subsystem **42**, a template subsystem **44**, a pattern comparator **46**, and a post-processor and decision logic subsystem **48**.

In operation, upon activation, the acoustic/audio policing system will begin sampling all (or a selected portion) of nearby acoustic signals. The acoustic signals will include voices and background noise. The background noise signals are generally known and predictable, and may therefore be easily filtered out using conventional filtering techniques. Among the expected noise signals are unfamiliar speech, automotive related sounds, honking, sirens, the sound of wind and/or rain.

The microphone input system **40** pick-up the acoustic signals and immediately filter out the predictable background noise signals and amplify the remaining recognizable acoustic signals. The filtered acoustic signals are ana-

lyzed in the analysis subsystem 42 which processes the signals by means of digital and spectral analysis techniques. The output of the analysis subsystem is compared in the pattern comparater subsystem 46 with selected predetermined words stored in memory in 44. The post processing and decision logic subsystem 48 generates an alarm signal, as described below.

The templates 44 include perhaps about 100 brief and easily recognizable terse expressions, some of which are single words, and are commonly used by those intent on a criminal act. Some examples of commonly used word phrases spoken by a criminal to a victim prior to a mugging, for example, include: "Give me your money", "This is a stick-up", "Give me your wallet and you won't get hurt" . . . etc. Furthermore, commonly used replies from a typical victim during such a mugging may also be stored as template words, such as "help", and certain sounds such as shrieks, screams and groans, etc.

The specific word templates, from which inputed acoustic sounds are compared with, must be chosen carefully, taking into account the particular accents and slang of the language spoken in the region of concern. Hence, a statistical averaging of the spectral content of each word must be used.

The output of the word recognition system shown in FIG. 4 is used as a trigger signal to activate a sound recorder, or a camera used elsewhere in the invention, as described below.

The preferred microphone used in the microphone input subsystem 40 is a shot-gun microphone, such as those commercially available from the Sennheiser Company of Frankfurt, Germany. These microphone have a super-cardioid propagation pattern. However, the gain of the pattern may be too small for high traffic areas and may therefore require more than one microphone in an array configuration to adequately focus and track in these areas. The propagation pattern of the microphone system enables better focusing on a moving sound source (e.g., a person walking and talking). A conventional directional microphone may also be used in place of a shot-gun type microphone, such as those made by the Sony Corporation of Tokyo, Japan. Such directional microphones will achieve similar gain to the shot-gun type microphones, but with a smaller physical structure.

A feedback loop circuit (not specifically shown) originating in the post processing subsystem 48 will direct the microphone system to track a particular dynamic source of sound within the area surveyed by video cameras.

An override signal from the video portion of the present invention will activate and direct the microphone system towards the direction of the field of view of the camera. In other words, should the video system detect a potential crime in progress, the video system will control the audio recording system towards the scene of interest. Likewise, should the audio system detect words of an aggressive nature, as described above, the audio system will direct appropriate video cameras to visually cover and record the apparent source of the sound.

A number of companies have developed very accurate and efficient, speaker independent word recognition systems based on a hidden Markov model (HMM) in combination with an artificial neural network (ANN). These companies include IBM of Armonk, N.Y., AT&T Bell Laboratories, Kurtzwell of Cambridge, Mass. and Lernout and Hauspie of Belgium.

Put briefly, the HMM applies probabilistic statistical procedure in recognizing words. In the training steps, an estimate is made of the means and covariance of the probabilistic model of each word, e.g., those words which are considered likely to be uttered in an interaction. The various ways which any given word is pronounced, permits the spectral parameters of the word to be an effective describer of the model. The steps involved in recognizing an input of an unknown word consists of computing the likelihood that the word was generated by each of the models developed during the training. The word is considered as "recognized" when its model gives the highest score. Finally, since the words are composed of word units, the evaluation of conditional probabilities of one particular unit followed by the same or another word unit is also part of the computation.

The resulting list of potential words is considerably shorter than the entire list of all spoken words of the English language. Therefore, the HMM system employed with the present invention allows both the audio and video systems to operate quickly and use HMM probability statistics to predict future movements or words based on an early recognition of initial movements and word stems.

The HMM system may be equally employed in the video recognition system. For example, if a person's arm quickly moves above his head, the HMM system may determine that there is a high probability that the arm will quickly come down, perhaps indicating a criminal intent.

While certain embodiments of the invention have been described for illustrative purposes, it is to be understood that there may be various other modifications and embodiments within the scope of the invention as defined by the following claims.

What is claimed:

1. A surveillance system, comprising:

a) a video camera for translating real images of an area into electronic video signals;

b) means for sampling movements of an individual located within the area from said electronic video signals of said video camera;

c) means for electronically comparing said sampled movements with predetermined characteristics of movements;

d) means for predicting future movements of said individual based on said electronic comparing means of said sampled movements; and

e) means for generating a signal responsive to predetermined predicted future movements.

2. The surveillance system in accordance with claim 1, wherein said signal generating means activates a video signal recorder for recording said video signals from said camera.

3. The surveillance system in accordance with claim 1, wherein said signal generating means activates a microphone for receiving audible information of said individual located in said area.

4. The surveillance system in accordance with claim 1, wherein said signal generating means activates at least one high resolution camera.

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